

## RE: Meeting Notes| Lead and Water Meters Response Follow-Up Call

Poy, Thomas

Thu 3/17/2016 1:09 PM

To: Caminer, Irene <Irene.Caminer@cityofchicago.org>;

Cc: Stark, Alan <Alan.Stark@cityofchicago.org>;

Irene: I also had a question about making the general public aware of the recommendation to flush taps that have not been used for long-periods of time, e.g., on the website.

Tom

---

Tom Poy  
Chief, Ground Water and Drinking Water Branch  
USEPA - Region 5  
(312) 886-5991

**From:** Caminer, Irene [mailto:Irene.Caminer@cityofchicago.org]  
**Sent:** Thursday, March 17, 2016 12:51 PM  
**To:** Poy, Thomas <poy.thomas@epa.gov>  
**Cc:** Stark, Alan <Alan.Stark@cityofchicago.org>  
**Subject:** FW: Meeting Notes| Lead and Water Meters Response Follow-Up Call

Tom,  
Alan sent me your email from yesterday. I had responded to everyone in Elise Lockamy's email and I guess you were not on it. My apologies. I have added the door hanger (which had not been completed at the time of the email).

Should you have any questions, please let me know.

Best,  
Irene

Irene Schild Caminer  
Director of Legal Services  
City of Chicago  
Department of Water Management - Commissioner's Office  
1000 E. Ohio Street  
Chicago, IL 60611  
Phone: 312-742-1028  
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**From:** Caminer, Irene

**Sent:** Friday, March 04, 2016 4:21 PM

**To:** 'Lockamy, Elise (CDC/ONDIEH/NCEH)'; Brown, Mary Jean (CDC/ONDIEH/NCEH); Kaka, Eddy; Lohff, Cortland; Harrold, Marguerite; Putz, Andrea

**Cc:** Bennett-Conner, Meredith L. (CDC/ONDIEH/NCEH); 'Stark, Alan ([Alan.Stark@cityofchicago.org](mailto:Alan.Stark@cityofchicago.org))'

**Subject:** RE: Meeting Notes| Lead and Water Meters Response Follow-Up Call

All,

Attached are our suggested edits to yesterday's meeting minutes. I have included Alan Stark on this email. Also, we have revised our construction letter and I have attached as a .pdf.

Best,

Irene

Irene Schild Caminer

Director of Legal Services

City of Chicago

Department of Water Management - Commissioner's Office

1000 E. Ohio Street

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**From:** Lockamy, Elise (CDC/ONDIEH/NCEH) [<mailto:vts8@cdc.gov>]

**Sent:** Thursday, March 03, 2016 2:40 PM

**To:** Brown, Mary Jean (CDC/ONDIEH/NCEH); Kaka, Eddy; Lohff, Cortland; Harrold, Marguerite; Caminer, Irene;

Putz, Andrea

**Cc:** Bennett-Conner, Meredith L. (CDC/ONDIEH/NCEH)

**Subject:** Meeting Notes| Lead and Water Meters Response Follow-Up Call

Good afternoon everyone,

Thank you for joining today's call.

If any errors or omissions are indicated in the notes below, please feel free to correct them. Forward this email to anyone not included here.

---

This conference call was initiated by CDC and facilitated by Cortland Lohff, Medical Director for Environmental Health at the Chicago Department of Public Health.

Last week Dr. Mary Jean Brown of the CDC Healthy Homes and Lead Poisoning Prevention Program provided recommendations to the Chicago Department of Public Health for alerting residents to the possible presence of lead in water sources after lines had been cut during water meter replacements. Specifically, Dr. Brown recommended that CDPH liaise with the local water authority to distribute messaging highlighting the importance of water testing, the use of water bottles until water lead levels are safe, and the importance of allowing time for the rebuilding of protective sediments. The recommendations prompted a phone call with CDPH and water authority officials.

Today, Dr. Brown revisited the recommendation to encourage residents to clean out water aerators after work is completed. The experience in other cities has been that lead levels go up once there are disturbances in header pipes.

Tom Poy, EPA region 5 official, clarified that a recent study with the Chicago Dept of Water Management was intended to examine water sampling protocols to inform revisions to the Lead and Copper Rule. He mentioned that EPA's action level for lead (currently 15ppb) is not a health-based number; rather, the figure is a chemistry indicator that corrosion protections have failed.

Allen and Andrea Putz of the Chicago water authority described the current recommendations in place following work performed on water lines. When work crews are still on site a thorough flush is conducted, whereby water on the first level is flushed for five minutes and then on subsequent levels moving up in order. Routine flushing is recommended after water has been sitting for 6 hours or more; the flushing should last five minutes and includes activities such as flushing the toilet and showering. The routine flushing recommendation applies to everyone, while the thorough flush applies to homes directly affected by water main work. Follow-up water sampling is not conducted. Tom agreed that the current flushing recommendations make sense given the information that is available concerning lead in water.

Dr. Brown noted that Jackson, MS has adopted the Flint, MI recommendation that children under six years of age and pregnant women should drink bottled water. The recommendation though is related to a change in water source and not lead pipe work.

CDPH officials feel comfortable moving forward with health education messaging with the water authority recommendations for flushing.

Currently, CDPH does not collect water samples when facilitating an inspection of the home of a child with an elevated blood lead level. A relationship between water lead levels and elevated blood lead levels was not found after convenience sampling of 170 homes.

A note about Chicago multi-unit homes: Most don't have lead services as iron piping is used.

NEXT STEPS: The water authority and EPA will share their flushing recommendations. After reviewing the materials, the group will determine if a follow-up call is required.

-Elise L.

**Elise Lockamy, MSPH**

Health Scientist|Project Officer

Centers for Disease Control & Prevention  
National Center for Environmental Health  
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Re: EPA contact

Lohff, Cortland <Cortland.Lohff@cityofchicago.org>

Thu 3/3/2016 8:40 AM

To: Poy, Thomas <poy.thomas@epa.gov>;

great. thanks tom.

i don't believe tom powers will, but several of his senior staff and engineers will be.

cort

**Cortland (Cort) Lohff, MD, MPH**

*Medical Director for Environmental Health*

2133 W. Lexington

Chicago, IL. 60612

office: 312-746-6621

BB: 312-339-0852

Chicago Department of Public Health

---

**From:** Poy, Thomas <poy.thomas@epa.gov>

**Sent:** Thursday, March 3, 2016 8:39 AM

**To:** Lohff, Cortland

**Subject:** RE: EPA contact

Cort: I can make the call. Tom Powers contacted our Regional Administrator about the CDC recommendation the other day. Do you know if Tom will be on the call?

---

Tom Poy

Chief, Ground Water and Drinking Water Branch

USEPA - Region 5

(312) 886-5991

**From:** Lohff, Cortland [mailto:Cortland.Lohff@cityofchicago.org]

**Sent:** Thursday, March 03, 2016 8:29 AM

**To:** Johnson, Mark <johnson.mark@epa.gov>

**Cc:** Poy, Thomas <poy.thomas@epa.gov>

**Subject:** Re: EPA contact

Mark - that would be great.

Tom - would love to have you join us if you can.

Purpose of the call: Discuss CDC recommendations for responding to indicators of high lead levels in water

Call-in instructions:

11:30 - 12:15 CST

855-644-0229; ID: 3672483

i'll be forwarding via separate email several documents that we may be reviewing during the call.

thanks

cort

**Cortland (Cort) Lohff, MD, MPH**

*Medical Director for Environmental Health*

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---

**From:** Johnson, Mark <[johnson.mark@epa.gov](mailto:johnson.mark@epa.gov)>

**Sent:** Thursday, March 3, 2016 8:01 AM

**To:** Lohff, Cortland

**Subject:** Re: EPA contact

Cort

I would also be interested in participating in that call if that would be OK.

Mark

Sent from my iPhone

On Mar 3, 2016, at 8:57 AM, Johnson, Mark <[johnson.mark@epa.gov](mailto:johnson.mark@epa.gov)> wrote:

Cort

Tom Poy would be the primary contact at EPA for drinking water issues (poy.thomas@epa.gov; 312-886-5991).

Mark

Sent from my iPhone

On Mar 3, 2016, at 8:36 AM, Lohff, Cortland <Cortland.Lohff@cityofchicago.org> wrote:

Hi Mark -

Hope this finds you well.

I was wondering if you could recommend someone from EPA region 5 with expertise in drinking water issues. I'm having a call with CDC and our local water utility this morning, and wanted to invite someone from there to join that call.

Thanks Mark,

Cort

**Cortland (Cort) Lohff, MD, MPH**

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## Fw: Lead and Water Meters Response

Lohff, Cortland <Cortland.Lohff@cityofchicago.org>

Thu 3/3/2016 8:30 AM

To: Johnson, Mark <johnson.mark@epa.gov>; Poy, Thomas <poy.thomas@epa.gov>;

4 attachments (3 MB)

NDWAC LCR Work Group Report Final 08 24 2015 (1).pdf; GAO (1).pdf; Rupp to State and Local Partners LCR Implementation 02-29-2016 (1).pdf; epa\_lcr\_sampling\_memorandum\_dated\_february\_29\_2016\_508 (1).pdf;

**Cortland (Cort) Lohff, MD, MPH**

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---

**From:** Lohff, Cortland

**Sent:** Wednesday, March 2, 2016 5:02 PM

**To:** Lockamy, Elise (CDC/ONDIEH/NCEH); Brown, Mary Jean (CDC/ONDIEH/NCEH)

**Cc:** Kaka, Eddy

**Subject:** Re: Lead and Water Meters Response

hi -

i've attached several documents forwarded to me from the Water Dept for your review.

have you folks been able to attend an epa region 5 official to join the call (was that invite going to come from you folks or from us)?

i've confirmed with our water dept that they will have representation on the call.

cort

**Cortland (Cort) Lohff, MD, MPH**

*Medical Director for Environmental Health*

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---

**From:** Jorgensen, Emile  
**Sent:** Monday, February 29, 2016 8:18 AM  
**To:** Lockamy, Elise (CDC/ONDIEH/NCEH); Brown, Mary Jean (CDC/ONDIEH/NCEH); Kaka, Eddy; Harrold, Marguerite; Lohff, Cortland  
**Subject:** RE: Lead and Water Meters Response

Hi,

Can someone, maybe Cort or Eddy, invite the water bureau people? Do you have an agenda, Elise? Has anyone seen the GAO report mentioned by the water bureau? Do we have an EPA person to join us? Maybe we can get one of the authors of the Chicago sampling and service line disturbance articles (ie, Del Toral, Porter or Schock)?

I have read a lot of the recent epidemiology of water and lead and a little bit of the engineering stuff and this is a very, very complicated area. I am going to suggest that getting cooperation from the water bureau is very important so someone (Cort?) should use a little diplomacy on them.

All the best,  
Emile

---

**From:** Lockamy, Elise (CDC/ONDIEH/NCEH) [mailto:vts8@cdc.gov]  
**Sent:** Friday, February 26, 2016 4:32 PM  
**To:** Brown, Mary Jean (CDC/ONDIEH/NCEH); Jorgensen, Emile; Kaka, Eddy; Harrold, Marguerite; Lohff, Cortland  
**Subject:** RE: Lead and Water Meters Response

Hello Everyone,

I hope you've already started what I hope will be a wonderful weekend for you.

I am going to send a meeting invitation for Thursday, March 3<sup>rd</sup> at 12:30pm eastern. If there are too many conflicts, we can reschedule. Please invite the appropriate persons to the meeting.

I look forward to hearing from you then.

-Elise L.

Elise Lockamy, MSPH  
CDC/ONDIEH/NCEH/DEEHS  
Healthy Homes and Lead Poisoning Prevention Program  
[vts8@cdc.gov](mailto:vts8@cdc.gov) | 770-488-0050

---

**From:** Lockamy, Elise (CDC/ONDIEH/NCEH)  
**Sent:** Tuesday, February 23, 2016 10:56 AM  
**To:** Brown, Mary Jean (CDC/ONDIEH/NCEH) <mjb5@cdc.gov>; Emile Jorgensen <Emile.Jorgensen@cityofchicago.org>; Eddy Kaka <Eddy.Kaka@cityofchicago.org>; Marguerite Harrold (Marguerite.Harrold@cityofchicago.org) <Marguerite.Harrold@cityofchicago.org>; Cortland Lohff <cortland.lohff@cityofchicago.org>  
**Subject:** RE: Lead and Water Meters Response

Thank you all for joining today's call. And many thanks for including the Chicago Department of Water Management personnel.

As discussed, CDC will review the Del Toral article and other resources provided before making further recommendations. We plan to re-engage next week with the inclusion of an EPA Region 5 official. I can help with the conference line and will gauge availability later this week.

Emile – please forward those last two resources that the Water officials will send to your attention.

Thanks and have a great rest of the week!

-Elise L.

Elise Lockamy, MSPH  
CDC/ONDIEH/NCEH/DEEHS  
Healthy Homes and Lead Poisoning Prevention Program  
[vts8@cdc.gov](mailto:vts8@cdc.gov) | 770-488-0050

-----Original Appointment-----

**From:** Lockamy, Elise (CDC/ONDIEH/NCEH)  
**Sent:** Monday, February 22, 2016 3:40 PM  
**To:** Lockamy, Elise (CDC/ONDIEH/NCEH); Brown, Mary Jean (CDC/ONDIEH/NCEH); Emile Jorgensen; Eddy Kaka; Marguerite Harrold ([Marguerite.Harrold@cityofchicago.org](mailto:Marguerite.Harrold@cityofchicago.org)); Cortland Lohff  
**Subject:** Lead and Water Meters Response  
**When:** Tuesday, February 23, 2016 10:00 AM-11:00 AM (UTC-05:00) Eastern Time (US & Canada).  
**Where:** Dial: 855-644-0229; ID: 3672483

**AGENDA:**

Review of the current public health issue (15 minutes)  
Response provided to date (10 minutes)  
Collaboration with water authority (10 minutes)  
Recommended Next Steps [with scientific foundation] (25 minutes)

---

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**Report of the Lead and Copper Rule Working Group  
To the National Drinking Water Advisory Council**

*FINAL*

AUGUST 24, 2015

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## Appendices

Appendix A – Lead and Copper Working Group Members

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## Figures

Figure 1 – Overview of Recommended Revised Lead and Copper Rule Framework

## **Abbreviations**

**AL** – Action Level  
**ALE** – Action Level Exceedance  
**CCR** – Consumer Confidence Report  
**CCT** – Corrosion Control Treatment  
**DWLRP** – Drinking Water Lead Reduction Plan  
**EPA** – Environmental Protection Agency  
**LAL** – Lead Action Level  
**LCR** – Lead and Copper Rule  
**LCRWG** – Lead and Copper Rule Working Group  
**LSL** – Lead Service Line  
**LSLR** – Lead Service Line Replacement  
**LTR LCR** – Long Term Revisions to the Lead and Copper Rule  
**MCLG** – Maximum Contaminant Level Goal  
**mg/L** – Milligram per Liter  
**µg/L** – Microgram per Liter  
**µg/dL** – Microgram per Deciliter  
**NDWAC** – National Drinking Water Advisory Council  
**OGWDW** – Office of Ground Water and Drinking Water  
**OCCT** – Optimum Corrosion Control Treatment  
**OWQP** – Optimal Water Quality Parameter  
**PE** – Public Education  
**pH** – Negative log of hydrogen ion molar concentration  
**PLSLR** – Partial Lead Service Line Replacement  
**POTW** – Publicly Owned Treatment Works  
**POU** – Point-of-use Treatment Device  
**PWS** – Public Water System  
**SAB** – Science Advisory Board  
**SDWA** – Safe Drinking Water Act  
**DWSRF** – Drinking Water State Revolving Fund  
**TT** – Treatment Technique  
**WQP** – Water Quality Parameter

## **Report of the Lead and Copper Rule Working Group to the National Drinking Water Advisory Council**

### **1. Executive Summary**

The Lead and Copper Rule Working Group (LCRWG) of the National Drinking Water Advisory Council (NDWAC) has completed its deliberations on issues associated with long term revisions to the Lead and Copper Rule (LCR). This report includes the group's findings and recommendations.

This executive summary provides a brief overview of the report. Details of the findings and recommendations are provided in the body of the report. A list of the members of the working group can be found in Appendix A.

#### **1.1. Charge**

The charge to the LCRWG was to provide advice to the NDWAC as it develops recommendations for the U.S. Environmental Protection Agency (EPA) on targeted issues related to long term revisions to the Lead and Copper Rule under the Safe Drinking Water Act (SDWA).

#### **1.2. Findings and Recommendations**

The anticipated Long Term Revisions to the Lead and Copper Rule (LTR LCR) is a very important opportunity for removing sources of lead in contact with drinking water and for reducing exposure to lead from drinking water in the meantime. Creative financing and robust public education also are essential.

The LCRWG took the following considerations, among others, into account in making recommendations for revisions to the LCR. A more detailed list of considerations is included in the full report.

There is no safe level of lead. Lead can pose health risks to anyone, but there are heightened risks for pregnant women, infants and young children and other vulnerable populations with both acute and chronic exposures. Effective elimination of leaded materials in contact with water and minimization of exposure to lead in drinking water is a shared responsibility; public water systems (PWSs), consumers, building owners, public health officials and others each have important roles to play. The lack of resources to reduce the sources of exposure in some communities, however, also raises important questions of disparate impact and environmental justice. Thus, creative financing mechanisms will be needed.

The LCR should remain a treatment technique rule, but it can be improved based on the scientific knowledge that has emerged since the current LCR was promulgated. Corrosion control treatment is complicated, and will vary based on specific circumstances in each public water system. Thus, regular updates to guidance by EPA based on the latest science and the creation of a national clearinghouse of information both for the public and for PWSs are needed.

The LCRWG considered but did not quantify the cost implications of its recommendations. An important factor in the group's deliberations was the principle that PWS and state resources should be focused on actions that achieve the greatest public health protection. Recognizing that lead service line (LSL) replacement programs will be costly in some locations, the LCRWG also encourages PWSs to incorporate

anticipated costs into their capital improvement program as appropriate to their situation, and urges states to include the costs of LSL replacement in their criteria for allocation of Drinking Water State Revolving Funds.

The LCRWG specifically recommends that EPA revise the LCR to:

- Require proactive lead service line (LSL) replacement programs, which set replacement goals, effectively engage customers in implementing those goals, and provide improved access to information about LSLs, in place of current requirements in which LSLs must be replaced only after a lead action level (AL) exceedance;
- Establish more robust public education requirements for lead and LSLs, by updating the Consumer Confidence Report (CCR), adding targeted outreach to consumers with lead service lines and other vulnerable populations (pregnant women and families with infants and young children), and increasing the information available to the public;
- Strengthen corrosion control treatment (CCT), retaining the current rule requirements to re-assess CCT if changes to source water or treatment are planned, adding a requirement to review updates to EPA guidance to determine if new scientific information warrants changes;
- Modify monitoring requirements to provide for consumer requested tap samples for lead and to utilize results of tap samples for lead to inform consumer action to reduce the risks in their homes, to inform the appropriate public health agency when results are above a designated household action level, and to assess the effectiveness of CCT and/or other reasons for elevated lead results;
- Tailor water quality parameters (WQPs) to the specific CCT plan for each system, and increase the frequency of WQP monitoring for process control;
- Establish a health-based, household action level that triggers a report to the consumer and to the applicable health agency for follow up;
- Separate the requirements for copper from those for lead and focus new requirements where water is corrosive to copper; and
- Establish appropriate compliance and enforcement mechanisms.

Although leadership by EPA is essential, reduction of exposure to lead in drinking water cannot be achieved by EPA regulation alone. Thus, this report also includes recommendations for renewed commitment, cooperation and effort by government at all levels and by the general public. We urge EPA to play a leadership role not only in the revisions to the LCR but also in educating, motivating, and supporting the work of other EPA offices; federal state and local agencies and other stakeholders. (See Section 4: Complementary Actions Critical to the Success of the National Effort to Reduce Lead in Drinking Water.)

## **2. Considerations and Background Information**

### **2.1. Considerations in Preparing this Report**

The members of the LCRWG brought different perspectives and expertise to the preparation of this report. Although not all members agreed with each and every consideration listed below, the LCRWG took one another's perspectives into account and, thus, the following concepts collectively underlie the recommendations in this report. Additional detail is provided in the recommendations section below.

- There is no safe level of lead. Lead can pose health risks to anyone, but there are heightened risks for pregnant women, infants and children with both acute and chronic exposures.
- Lead-bearing plumbing materials in contact with drinking water pose a risk at all times (not just when there is a lead action level (LAL) exceedance).
- Effective elimination of leaded materials in contact with water and minimization of exposure to lead in drinking water is a shared responsibility. PWSs, consumers, building owners, public health officials and others each have important roles to play.
- The LTR LCR is an important opportunity for removing sources of lead in contact with drinking water and for reducing exposure to lead from drinking water in the meantime. However, additional action beyond the scope of the Safe Drinking Water Act is needed. Removing lead from drinking water systems also will require renewed commitment, cooperation and effort by government at all levels and by the general public. (See Section 4: Complementary Actions Critical to the Success of the National Effort to Reduce Lead in Drinking Water.)
- Proactive action is needed to remove the sources of lead, with appropriate incentives both for PWSs and their customers needed to encourage such action.
- Successful implementation of the revised LCR can only take place in the context of a more holistic effort on lead in water issues involving stakeholders other than just EPA and water systems, and resources beyond those able to be brought to bear by water systems. Partnerships at all levels are essential. Recognizing that public agency budgets are tighter than ever, greater engagement by local health agencies, those funding housing programs, and those involved in permitting and construction is particularly important.
- Creative financing mechanisms also will be needed to achieve this goal for all individuals potentially exposed to lead, regardless of race, ethnicity or income. Leaving a lead service line in place because a low-income resident does not have the means to pay raises serious questions of disparate impact and environmental justice.
- The public plays a critical role in protecting their families' health by reducing exposure to lead and copper, and informing the public enables them to be effective participants in implementing their share of the responsibility.
- The issues associated with lead and copper are very different and warrant more separate attention than has been the case in the past.
- The LCR should remain a treatment technique rule, but it can be improved.
- Corrosion control treatment (CCT) is complex, dynamic, and varies based on the circumstances in each PWS. The understanding of the challenges with CCT has improved in recent years, but questions still remain.
- Attention to unintended consequences is important generally and, in particular, with respect to CCT.
- The presence of lead-bearing materials in premise plumbing raises issues about what systems can implement in customers' homes.
- Attention to what States are able to oversee and enforce also is important.
- PWS and state resources should be focused on actions that achieve the greatest public health protection.

## 2.2 Regulatory Background and Formation of the NDWAC Lead and Copper Work Group

Under the Safe Drinking Water Act EPA sets public health goals and enforceable standards for drinking water quality.<sup>1</sup> The Lead and Copper Rule is a treatment technique rule. Instead of setting a maximum contaminant level (MCL) for lead or copper, the rule requires (PWSs) to take certain actions to minimize lead and copper in drinking water, to reduce water corrosivity and prevent the leaching of these metals from the premise plumbing and drinking water distribution system components and when that isn't enough, to replace lead service lines under their control. The current rule sets an action level (AL), or concentration, of 0.015 mg/L for lead and 1.3 mg/L for copper. An AL is not the same as an MCL. An MCL is based on health effects and feasibility; whereas an action level is a screening tool for determining when certain treatment technique actions are needed.

The LCR action level is based on the practical feasibility of reducing lead through controlling corrosion. In the LCR, if the AL is exceeded in more than ten percent of tap water samples collected during any monitoring period (i.e., if the 90<sup>th</sup> percentile level is greater than the AL), it is not a violation, but triggers other requirements that include water quality parameter monitoring, corrosion control treatment (CCT), source water monitoring/treatment, public education, and lead service line replacement (LSLR). The rule also requires States to report the 90<sup>th</sup> percentile for lead concentrations to EPA's Safe Drinking Water Information System (SDWIS) database for all water systems serving 3,300 or more persons, and for those systems serving fewer than 3,300 persons only when the lead action level (LAL) is exceeded. States only report the 90<sup>th</sup> percentile for copper concentrations in SDWIS when the copper action level is exceeded in water systems regardless of the size of the service population. Public education requirements ensure that drinking water consumers receive meaningful, timely, and useful information that is needed to help them limit their exposure to lead in drinking water.

Copper is a common material used in household plumbing and drinking water service lines in the United States. Copper is an essential nutrient in small amounts; however, acute ingestion of excess copper in drinking water has been associated with adverse health effects, including acute gastrointestinal symptoms such as abdominal discomfort, nausea, and vomiting.

The SDWA requires EPA to set MCLGs at concentration levels at which no known or anticipated adverse effects would occur, allowing for an adequate margin of safety. EPA proposed an MCLG of 1.3 mg/l for copper in 1985, and finalized that MCLG in 1991 when the LCR was promulgated. The LCR set the action level (AL) for copper, the level at which treatment technique actions are triggered for the water system, equal to the MCLG. The AL is triggered if the 90<sup>th</sup> percentile level of water samples is exceeded. All community water systems must report the 90<sup>th</sup> percentile level and the number of samples that exceeded the 90<sup>th</sup> percentile in their Consumer Confidence Reports.

In early 2004, EPA began a wide-ranging review of the implementation of the LCR to determine if there was a national problem related to elevated levels of lead in drinking water. As part of its national review, EPA collected and analyzed lead concentration data and other information, carried out a review of implementation in States, held four expert workshops to discuss elements of the regulations, and worked to understand local and State efforts to monitor for lead in school drinking water, including a national meeting to discuss challenges and needs. EPA released a Drinking Water Lead Reduction Plan (DWLRP) in March 2005. This plan outlined short-term and long-term goals for improving implementation of the

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<sup>1</sup> EPA establishes national primary drinking water regulations (NPDWRs) under SDWA. NPDWRs either establish a feasible maximum contaminant level (MCL) or a treatment technique "to prevent known or anticipated adverse effects on the health of persons to the extent feasible."



LCR. The plan can be found at the following web address:  
[http://water.epa.gov/lawsregs/rulesregs/sdwa/lcr/lead\\_review.cfm](http://water.epa.gov/lawsregs/rulesregs/sdwa/lcr/lead_review.cfm)

In 2007, EPA promulgated regulations, which addressed the short-term revisions to the LCR that were identified in the 2005 DWLRP. These requirements enhanced the implementation of the LCR in the areas of monitoring, treatment, LSLR, public education, and customer awareness. These revisions were intended to better ensure drinking water consumers receive meaningful, timely, and useful information needed to help them limit their exposure to lead in drinking water.

A number of Safe Drinking Water Act (SDWA) amendments aim to reduce lead in drinking water by limiting the amount of allowable lead in plumbing materials that come into contact with drinking water. In 1986, the SDWA was amended to prohibit the “use of any pipe, any pipe or plumbing fitting or fixture, any solder, or any flux, in the installation or repair of (i) any public water system; or (ii) any plumbing in a residential or non-residential facility providing water for human consumption, that is not lead free”. Lead Free was defined as solder and flux with no more than 0.2% lead and pipes with no more than 8% lead.

Congress again amended the SDWA in 1996, to prohibit the introduction into commerce of any pipe, pipe or plumbing fitting or fixture that is not lead free and to also require pipes, pipe or plumbing fittings or fixtures be in compliance with 3<sup>rd</sup> party lead leaching standards. These provisions ensure that only products meeting the lead free definition are sold in the U.S. and that pipes, pipe or plumbing fittings or fixtures are certified to be lead free.

The Reduction of Lead in Drinking Water Act of 2011 revised the maximum allowable lead content from not more than 8% to not more than a weighted average of 0.25% lead and included a calculation procedure for determining the weighted average; further reducing the amount of lead in contact with drinking water. It also eliminates the federal requirement to comply with the lead leaching standard and included exemptions from the lead free definition for plumbing devices that are used exclusively for non-potable services and also for specific plumbing devices such as toilets, bidets and urinals. The Community Fire Safety Act of 2013 further amended the SDWA to add fire hydrants to the list of exempted plumbing devices.

EPA has continued to work on the long-term issues that required additional data collection, research, analysis, and full stakeholder involvement, which were identified in the 2005 DWLRP and the 2007 rule revisions. This action is referred to as the LCR Long-Term Revisions (LTR). The LCR LTR would apply to all community water systems (CWSs) and non-transient non-community water systems (NTNCWSs). In this report, the term public water system (PWS) is meant to refer to both of these categories but not to transient non-community water systems.

Seeing the need for additional input on potential revisions to the Lead and Copper Rule, EPA requested that the National Drinking Water Advisory Committee (NDWAC) form the Lead and Copper Rule Working Group (LCRWG) to consider several key questions for the LCR LTR, taking into consideration previous input. The LCRWG met seven times in 2014 and 2015 to produce this report, and sought input from the NDWAC in advance of the last meeting to understand and address questions the NDWAC might have about the working group’s recommendations.

A list of members of the working group is provided in Appendix A. This report was approved by the LCRWG, with one dissent.

### **3. Recommendations for Revisions to the Lead and Copper Rule**

The long term revisions to the LCR is an important opportunity for removing sources of lead in contact with drinking water and for reducing exposure to lead from drinking water in the meantime. Creative financing and robust public education also are essential.

The LCRWG offers the following recommendations, based on information provided to the work group and on the work group's own deliberations. The LCRWG considers these recommendations to be an integrated package, not a menu of choices from which some recommendations can be selected and combined with others. This package reflects a concerted attempt to strengthen public health protection, which includes targeting the resources available to PWSs for the greatest public health value. While individual members might differ on specific recommendations, the work group (with one dissent) agrees that this package of recommendations constitutes an improvement over the current LCR.

The LCRWG carefully considered the information and questions posed by EPA in a white paper prepared for the working group. In its deliberations, the LCRWG came to the conclusion that the lessons learned from the implementation of the current LCR warranted a fresh look at the premises of the regulation. To truly solve the problem of exposure to lead in drinking water, the LCRWG concluded that lead-bearing materials should be removed from contact with drinking water to the greatest degree possible, while minimizing the risk of exposure in the meantime. That premise has led to a different paradigm for a revised LCR and, thus, to a somewhat different set of assumptions than underlay questions posed to the working group.

The diagram on page 12 illustrates the conceptual framework of the recommendations that follow.

The LCRWG specifically recommends that EPA revise the LCR to:

- Require proactive LSL replacement programs, which set replacement goals, effectively engage customers in implementing those goals, and provide improved access to information about LSLs, in place of current requirements in which lead service lines (LSLs) must be replaced only after a lead action level (AL) exceedance and CCT;
- Establishes more robust public education, by creating a national clearinghouse of information for the public and templates for PWSs, by updating the Consumer Confidence Report, adding targeted outreach to consumers with lead service lines and other vulnerable populations (pregnant women and families with infants and young children), and increasing the information available to health care providers and the public;
- Strengthen corrosion control treatment (CCT), retaining the current rule requirements to re-assess CCT if changes to source water or treatment are planned, adding a requirement to review updates to EPA guidance to determine if new scientific information warrants changes;
- Modify monitoring requirements to provide for consumer requested tap samples for lead and to utilize results of tap samples for lead to inform consumer action to reduce the risks in their homes, to inform the appropriate public health agency when results are above a designated household action level, and to assess the effectiveness of CCT and/or other reasons for elevated lead results;
- Tailor water quality parameters to the specific CCT plan for each system, and increases the frequency of WQP monitoring for process control;

- Establish a health-based, household action level that triggers a report to the consumer and to the applicable health agency for follow up;
- Separate the requirements for copper from those for lead and focus new requirements where water is corrosive to copper; and
- Establish appropriate compliance and enforcement mechanisms.

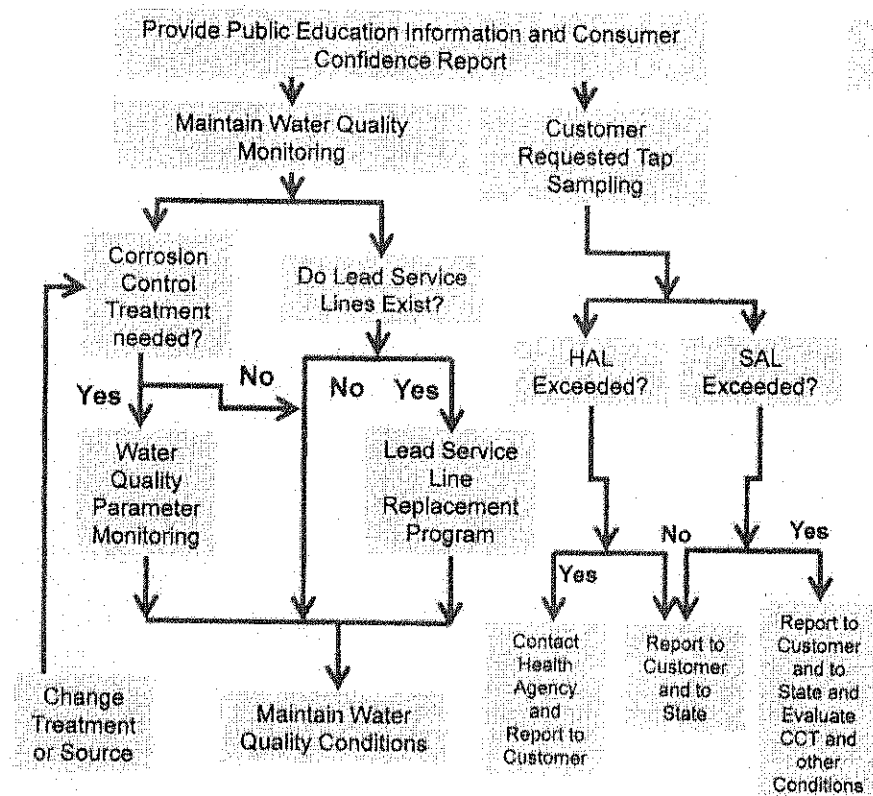
Although leadership by EPA is essential, reduction of exposure to lead in drinking water cannot be achieved by EPA regulation alone. Thus, this report also includes recommendations for renewed commitment, cooperation and effort by government at all levels and by the general public. We urge EPA to play a leadership role not only in the revisions to the LCR but also in educating, motivating, and supporting the work of other EPA offices; federal, state and local agencies and other stakeholders. (See Section 4: Complementary Actions Critical to the Success of the National Effort to Reduce Lead in Drinking Water.)

Figure 1

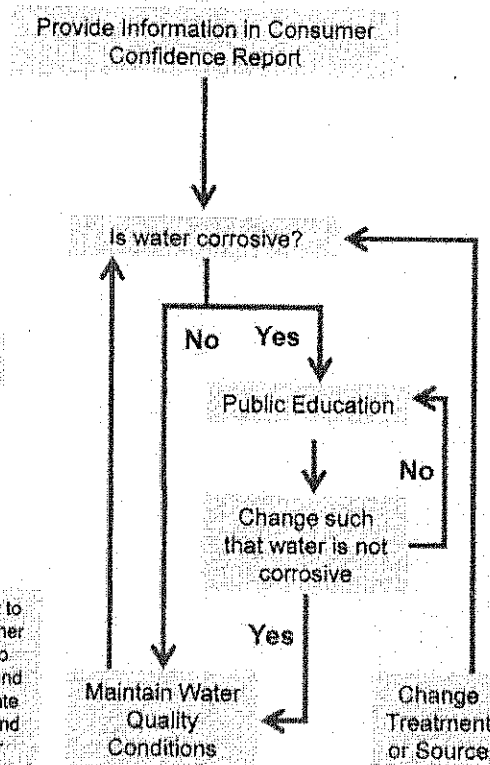
# Overview of Recommended Revised Lead and Copper Rule Framework

Note: Compliance steps are embedded throughout the framework

## Lead Control Program



## Copper Control Program



### 3.1. Replace Lead Service Lines<sup>2</sup>

Removing the sources of lead in drinking water should be a national goal. More proactive action than has taken place to date is needed to achieve it.

Although success in achieving this goal will require a concerted effort by many and can not be accomplished solely through the authorities provided under the Safe Drinking Water Act, revisions to the Lead and Copper Rule are an important component to achieving this goal and should be structured accordingly. [See Section 4 for recommendations that complement revisions to the LCR.]

The existing LCR has not created sufficient incentives to fully replace LSLs and other sources of lead, because LSL replacement is only required when the lead AL has been exceeded and optimizing CCT is insufficient to bring a system back under the action level. Systems that do not exceed the lead AL will never have to implement a LSL replacement program. Further, the link to action level exceedance does not allow adequate time for a well-planned LSLR program, and a significant unintended consequence where systems have had to implement a LSL replacement program quickly has been an increase in partial LSL replacement.

EPA asked the Science Advisory Board (SAB) to evaluate the current scientific data regarding the effectiveness of PLSLR and the review centered around five issues: (1) associations between PLSLR and blood lead levels in children; (2) lead tap water sampling data before and after PLSLR; (3) comparisons between partial and full LSLR; (4) PLSLR techniques; and (5) the impact of galvanic corrosion. The SAB found that the quantity and quality of the available data are inadequate to fully determine the effectiveness of PLSLR in reducing drinking water lead concentrations. The small number of studies available had major limitations (small number of samples, limited follow-up sampling, lack of information about the sampling data, limited comparability between studies, etc.) for fully evaluating PLSLR efficacy.

While recognizing the limits to current data, the SAB concluded that PLSLRs have not been shown to reliably reduce drinking water lead levels in the short-term, ranging from days to months, and potentially even longer. Additionally, PLSLR is frequently associated with short-term elevated drinking water lead levels for some period of time after replacement, suggesting the potential for harm, rather than benefit during that time period. The available data suggest that the elevated tap water lead levels tend to increase then gradually stabilize over time following PLSLR, sometimes at levels below and sometimes at levels similar to those observed prior to PLSLR. The SAB also concluded that in studies comparing full LSLR versus PLSLR, the evaluation periods were too short to fully assess differential reductions in drinking water lead levels. However, the SAB explained that full LSLR appears generally effective in achieving long-term reductions in drinking water lead levels, unlike PLSLR. Both full LSLR and PLSLR generally result in elevated lead levels for a variable period of time after replacement. The limited evidence available suggests that the duration and magnitude of the elevations may be greater with PLSLR than full LSLR.

Taking all of these considerations into account, the LCRWG has concluded that an effective framework for replacement of LSLs would include the following and, thus, the LCR should be revised accordingly:

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<sup>2</sup> 40 CFR 141.2 defines: "Lead service line means a service made of lead which connects the water main to the building inlet and any lead pigtail, gooseneck or other fitting which is connected to such lead line."

- Requiring all PWSs to establish a LSL replacement program that effectively informs and engages customers to share appropriately in fully removing LSLs, unless they can demonstrate that LSLs are not present in their system;
- Modifying the definition of lead service lines to include any service line where any portion, including a lead pigtail, gooseneck or other fitting, is made of lead;
- Clear guidance, case studies, and templates for LSL replacement programs, including a toolkit of ideas for creative financing strategies;
- Targeted outreach to customers with LSLs, with information about the risks of lead exposure, an offer to test a tap sample, and information about and encouragement to participate in the LSL replacement program;
- Dates by which systems should have met interim goals and completed replacement of all LSLs and PLSLs, without penalty to PWSs for those homeowners who refuse to participate in the replacement program as long as the PWS has made a meaningful effort to work with such a homeowner;
- Creating incentives for understanding where LSLs and PLSLs exist, while making action on full replacement, rather than on investigation of the location of LSLs and PLSLs the priority;
- Maintaining ongoing-outreach to homeowners where LSLs or PLSLs still exist;
- Implementation of standard operating procedures (SOPs), either from EPA guidance or tailored to the system, that helps define operations that disturb LSLs and practices to minimize disturbance and consumer exposure to lead;
- Stronger programs to educate consumers, and to provide test results of tap samples at the request of consumers;
- Focus efforts on action to replace LSLs rather than on the time and expense of upfront plan approval and on using simplified reporting to the states so they would only need to intervene when problems arise; and
- Requirements that provide strong encouragement for full LSL replacements, with the understanding that there may be justifiable exceptions and that those exceptions would occur only after the efforts outlined in the recommendations below on the part of the PWS to work with customers to complete a full LSL replacement. Such exceptions might include emergency repairs where property owners have refused to participate in a full LSL replacement; during a main replacement project; or when a sufficiently high percentage of property owners participate in an area-wide LSL replacement project to justify replacing LSLs to the property lines of those who do not participate at the time. Revisions to the LCR should include options for risk management to occupants of those properties with remaining, partial lead service lines, e.g. additional sampling, filters, dielectrics to reduce the risk of galvanic corrosion, plastic piping, aggressive premise flushing, etc.

### 3.1.1. Update Inventories and Improve Access to Information about Lead Service Lines

Updating and improving access to information about the location of both full and partial lead service lines is both essential to ensuring LSLs are replaced and important for successful, proactive outreach to customers who are most likely to have a LSL.

The LCRWG recommends combining:

- 1) The presumption that a service line put in place prior to the date when lead service lines were prohibited has leaded materials unless the PWS has information to confirm that it not, with
- 2) Providing credit to a PWS toward its replacement goals for demonstrating that a service line presumed to include lead does not have leaded materials.

This approach is intended to create incentives for prompt action to develop an accurate inventory of LSLs and PLSLs in part by being overly conservative initially on the potential existence of LSLs, time to organize an effective replacement program, and an opportunity to take action to replace LSLs rather than devoting time and resources on planning documents that must be approved by the primacy agency.

The LCRWG recognizes that PWSs vary in the amount of information they have about the location of full and partial LSLs. EPA should take the impact on small and medium systems into account when developing the proposed rule.

The LCRWG also recognizes that the current definition of a lead service line exempts a service line that has a lead pigtail or gooseneck or other fitting but is otherwise not made of lead. We recommend that the LCR be revised to remove this exemption since a lead pipe, even if only a small portion, poses a sufficiently similar risk as a full lead service line. Because utilities may not know where these portions are and may not be able to locate them without excavating, we recommend that the presumption described above not apply to lines where the utilities do not have information or are unaware of their use. Finally, we recommend that these fittings be replaced when they are encountered during excavations and that the applicable operations and customer engagement requirements described in the next section apply.

In addition, the LCRWG recommends that all PWSs should establish a clear mechanism for customers to access information on LSL locations (at a minimum). Detailed public education recommendations for both lead and copper follow in separate sections. With respect to information about LSLs, PWSs should:

- Have outreach materials that indicate that property specific information is available.
- Inform customers who may have LSLs about the risks of partial line replacement, who is responsible for paying for replacing the service line, and the legal basis of that determination.
- Provide information it has about LSLs to existing home owners and residents on request.
- Provide information to realtors, home inspectors, and potential home buyers on request
- Communicate that this information is subject to disclaimer for accuracy based on information available to the PWS.
- Develop a system to track LSL replacement.

Where a service line serves multiple dwellings or places such as schools or child care centers that have many children, EPA should establish a formula for giving an extra weight or numerical count to these.

lines in the initial inventory to recognize the additional children that would be affected and effectively prioritize replacement of these LSLs.

### 3.1.2. Establish Active LSL Replacement Programs

Proactive LSL replacement programs by PWSs and their customers are key to moving to a future in which lead is not in contact with drinking water. To accomplish this, the LCRWG recommends replacing the current regulations, in which LSL replacement is required only if a PWS has a lead AL exceedance and after the PWS takes action to operate CCT, because this has not resulted in the complete replacement of many LSLs across the country.<sup>3</sup>

Instead, a revised LCR should include a requirement that all PWSs with lead service lines prepare and implement a LSL replacement program, along with a combination of changes to the regulatory approach described in this report and supportive actions by other public and private agencies, customers and other stakeholders. Taking this approach has the advantages of making replacement of LSLs something all systems do and of establishing programs that are put in place in an organized and measured way.

Supportive actions include increased funding of federal lead risk reduction programs under the Department of Housing and Urban Development (HUD) to help fund customer-owned portions of LSLs and to consider federal tax deductions for this purpose. Additionally, states should pass legislation requiring inspection, disclosure and/or replacement of LSLs on sale of property, and when lines have been disturbed as part of a renovation. Details on these and other ideas are included in Section 4 of this report.

The LCRWG recommends that EPA include the following revisions to the LCR:

1. Goal: PWSs will work with their customers to implement full replacement of all lead service lines in their service areas according to the milestones outlined in Table 1. Revisions to the LCR should maximize the likelihood of achieving this goal, consistent with the recommendations in this section. EPA should urge PWSs to work with their customers to replace LSLs in their service areas more quickly, while recognizing that the recommended approach of replacing LSLs in all PWSs with LSLs adds a new and potentially costly requirement for utilities and their customers with LSLs who currently are not and may not ever be triggered into a LSLR program under the current rule.
2. Interim Milestones: PWSs that identify LSLs in their inventory should be required to perform targeted outreach to customers on the inventory of LSLs and to work with them to replace LSLs according to a sequence of three-year milestones,<sup>4</sup> beginning 36 months after the effective date of a revised LCR. Milestones would be set at a faster pace in earlier years and would recognize progress may be more difficult to achieve in later years with those LSLs that remain at that time. Table 1 provides an illustration of this concept. PWSs should be encouraged to contact a larger number of homeowners than needed for compliance, since some homeowners may fail to reply or may refuse to participate. If replacement goals are not met, the revised LCR should require the PWS to take additional actions intended to enhance interest in and incentives for customer participation in full LSL replacement. The details of this approach should be determined by EPA with the intent of the LCRWG being that the PWS be given the flexibility to choose among

<sup>3</sup> EPA estimates that there were approximately 10.5 million LSLs in 1988 before the promulgation of the LCR and approximately 7.3 million LSLs now.

<sup>4</sup> Three years is a standard reporting timetable for drinking water regulations.



options that are appropriate for the size and type of ownership of the system and that the number of required efforts would increase over time if replacement goals are not met. EPA should seek to add to the initial list of options suggested in Table 2 to ensure a robust menu for PWSs to choose from (again considering system size and type of ownership) to avoid a situation where a PWS is forced into specific actions; and EPA should set the number of required efforts with consideration for the number and feasibility of choices provided.

3. Replacement Credit: The following actions can be counted toward the cumulative replacement requirement:

- Full LSL replacement
- Replacement of lead pigtail where the pigtail is the only lead material on the service line
- Confirmation that an LSL included in the initial inventory is not lead.

PLSLR will not be counted toward this requirement. Lack of response or refusal to participate by the customer also will not count toward replacement milestones.

4. Targeted Outreach: EPA should create a list of options in the rule of approved outreach methods for contacting customers with LSLs and inviting them to participate in the utility's LSLR program. Table 2 provides an initial list of options for such resident engagement, along with additional system policies and other actions if milestones aren't met. EPA also should provide guidance and/or templates for these options. For compliance purposes, the revised LCR should require that a PWS individually notify customers with known or possible LSLs describing the risks of lead in drinking water, specifically inviting them to participate in the LSLR program, and clearly describing the terms of the program, and how to follow up. If the customer does not respond or chooses not to participate, the PWS must follow up with another invitation at least every three years and always when there is a new customer at that address until the full LSL is replaced.
5. Control and Responsibility: The revised LCR should require PWSs to clearly state how the PWS defines ownership of LSLs, who has what financial responsibility for the replacement, what the legal basis is for that determination and any financial assistance programs that may be available.
6. Planning and Financing Options: EPA should provide a template and guidance for planning LSL replacement programs, including reference to options to assist customers replace their portion of lead service lines. Small systems may wish to refer to a national information source, such as one provided by EPA; large systems may wish to tailor such information to their circumstances. (See section 4 for further detail.)
7. Operations and Customer Engagement: EPA also should provide guidance on PWS policies and procedures for how to engage customers in full lead service line replacement and to inform them on appropriate risk reduction measures. PWSs should adopt templates provided in guidance by EPA or, for larger systems, their own standard operating procedures (SOPs) and make them available to their customers and the primacy agency for:
- a) planned capital projects by the PWS that would require:
    - o Prior notification (e.g., 45 days prior to planned main replacement or repair) - Contact letter to affected households likely to have lead service lines, providing information about lead service lines, associated risk, risk reduction options, and full-lead service line replacement options.

- Reminder of flushing post LSLR (e.g., 48 hours prior to actual field work affecting structure) -- Door hanger (or alternative direct contact) with information on flushing and POU devices immediately after lead service line replacement.
  - b) emergency main and service line repairs by the PWS that would define how to manage potential disturbance to LSLs safely:
    - Direction to information on lead service lines, associated risk, risk reduction options, and full-lead service line replacement options.
    - Door hanger (or alternative direct contact) with information on flushing and POU devices immediately after lead service line replacement.
  - c) flushing of service lines after lead service line replacement:
    - Flush outside hose bib or similarly located spigot close to the meter
    - Initial flush followed by house flush by homeowner or plumber using multiple taps to maximize water velocity
    - Information on proper use of filters when lead levels might be high
  - d) Requiring PWSs to inform other utilities (e.g. power, cable) whose work might affect water service lines or water mains, both proactively and at “mark out” for specific projects, about how to manage potential disturbances safely and about information to provide residents of affected homes about potential risks and risk mitigation measures. Those other utilities would have the responsibility to alert residents.
8. Community and NTNC water systems (schools, hospitals, churches, jails, etc.) who own the system and control the entire distribution system should replace LSL's as soon as practical, at a timetable to be determined by EPA. This requirement would not apply to community systems where the majority of the connections are individual residential connections (such as mobile home parks and HOA's) where there may be complications due to property ownership of the residence.

The LCRWG discussed and agreed that EPA guidance should encourage PWSs to make every effort to ensure that LSL replacement provides equal protection to low income customers (or rental units with low income residents), people of color and others protected by civil rights law and policy. Environmental justice and civil rights considerations are particularly important in those jurisdictions where the PWS requires the property owner to pay a share of the costs of removing the LSL. Making environmental justice a priority can be achieved through creative financing programs for low-income customers and setting priorities for which neighborhoods are targeted first for LSLR to ensure equal treatment of low income neighborhoods.

The LCRWG also discussed but did not agree that the definition of control as ownership should be changed in the revised LCR. In the current LCR, when a system exceeds the LAL, EPA requires water systems to replace only that portion of the LSL that it owns. This is based on EPA's current interpretation of the term “control” in the definition of public water system as limited to ownership. Some members of the LCRWG urged that the current definition of control as “ownership” should be replaced with a requirement that PWSs must replace the entire LSL, where they have the authority to “replace, repair, or maintain” the line or where they have other forms of authority over the LSL. However, the LCRWG also recognized that some utilities are prevented by law from spending public funds on private property and that gaining physical access to private property poses significant legal issues when a property owner objects.

The LCRWG does agree that the revised LCR should require PWSs to inform customers about the scope of their responsibility with regard to LSL replacement and the legal basis for that decision.

### 3.1.3 LSL Compliance

#### 3.1.3.a LSL Replacement Compliance

Recordkeeping:

- Inventory of LSLs
- Customer refusals to participate in full LSL replacement

Reporting: At the end of each three year period, each PWS must provide to the primacy agency:

- Certification of the outreach and other efforts implemented (see Table 2 for initial examples);
- Report on the change in the number of LSLs removed from the inventory with better information;
- Report on the number of full LSLs replaced; and
- Report on locations where the utility side LSL was replaced, but the homeowner did not replace the private portion

Violations:

- Failure to conduct required outreach;
- Failure to step up intensity of efforts if 3-year LSL replacement target has not been met;
- Failure to provide on-going outreach to new customers and to follow up (at least every 3 years) with customers at locations with full or partial LSL who do not respond or chose not to participate in the LSL replacement program;
- Outreach materials do not meet the content requirements of the rule

#### 3.1.3.b Operations and Customer Engagement Compliance

PWS must maintain records of who was notified, when notice was given, and content of notice for each capital project. (for 7a and 7b)

Violations:

- Lack of timely notice to customer that LSL removal is scheduled
- Notice materials do not meet rule content requirements

PWS also must develop SOP, and maintain records that it was provided to all utilities conducting activities which may impact LSL (for 7d)

Violation:

- PWS has not developed an SOP (or adopted an SOP template available on the National Clearinghouse) or not provided it to other utilities

### 3.2 Develop Stronger Public Education Requirements and Programs for Lead and LSLs

Given the public's role in the shared responsibility nature of the LCR, notifying and educating the public about lead in drinking water is important for risk reduction. Public education about the risks of lead in drinking water also is important regardless of whether LSLs are present, since lead can be present in other

premise plumbing materials. Moreover, targeted outreach and, possibly, other efforts are a key to the success of LSL removal programs. The current LCR does not adequately focus on creating on-going opportunities to educate customers on the risks of LSLs or on opportunities to replace them, especially when action is most likely, e.g. at the sale of a home.

The objectives of public education programs should include consumer understanding of: 1) the risks of lead in drinking water; 2) the likelihood that the water in one's home may contain lead; 3) the LCR as a "shared responsibility" rule; and 4) the availability of additional resources that consumers can use to better minimize their exposure to lead.

Although the LCRWG was briefed on and has experience with public education requirements and practices, it does not include members whose specific area of expertise is consumer-centered risk communication. Thus, the LCRWG generally recommends that public education programs for lead should move away from past practices of one-way communication from "experts" to the "public" toward newer concepts of risk communication that involve sustained, multiple, two-way channels of ongoing communication and partnership with the public.<sup>5</sup> EPA should consult with those with such expertise about the outreach and communication recommendations in this report, and encourage and apply best practices in effective ways to communicate with the public.

Communication in languages appropriate to the demographics of the community, in clear terms understandable by the public, and with engaging, reader-friendly graphics, photos, and video all help achieve greater understanding. Outreach programs and materials can be improved by involving people with diverse, and consumer-oriented expertise and perspectives, including consumer-centered risk communication experts, community members with extensive experience with lead in water including individuals not necessarily affiliated with an organization, lead/copper corrosion experts, grassroots public-health workers, and staff of PWSs, state and federal regulatory agencies and public health agencies. This information can and should be conveyed in different ways and through different communication channels, tailored to the specific circumstances.

Thus, with these and other considerations in mind, the LCRWG recommends that EPA, in consultation with the aforementioned stakeholders and drawing on principles of consumer-centered risk communication:

- Establish an easily accessible, national clearinghouse of information about lead in drinking water to serve the needs of the public and of public water systems (section 3.2.1).
- Require information be sent to all new customers on the potential risks of lead in drinking water (section 3.2.2)
- Revise the current CCR language to address lead service lines and update the health statements (section 3.2.3). Add requirements for targeted outreach to customers with lead service lines (section 3.1.1).

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<sup>5</sup> Resources include: 1) EPA's "Risk Communication in Action" (<http://nepis.epa.gov/Adobe/PDF/6000012U.pdf>) ; 2) EPA's "7 Cardinal Rules of Risk Communication" ([http://www.wvdhhr.org/bphtraining/courses/cdcvenergy/content/activeinformation/resources/epa\\_seven\\_cardinal\\_rules.pdf](http://www.wvdhhr.org/bphtraining/courses/cdcvenergy/content/activeinformation/resources/epa_seven_cardinal_rules.pdf)); and 3) Education & Communication WG Report 2010; National Conversation on Public Health and Chemical Exposures ([http://www.resolve.org/site-nationalconversation/files/2011/02/Education\\_and\\_Communication\\_Final\\_Report.pdf](http://www.resolve.org/site-nationalconversation/files/2011/02/Education_and_Communication_Final_Report.pdf))

- Strengthen requirements for public access to information about lead service lines, tap monitoring results, and other relevant information (section 3.2.4).
- Expand the current requirements for outreach to caregivers/health care providers of vulnerable populations (section 3.2.5)

As part of EPA's consultation with the aforementioned communication experts and stakeholders, the LCRWG recommends that EPA include consultation about methods that would increase public awareness of and motivation to learn about the effects of lead in drinking water and the benefits of removing these materials and/or taking regular precautions when cooking or drinking, regardless of whether LSLs are present or there has been a lead AL exceedance. Consistent with this advice, EPA also should take small systems into account and consider whether such methods should be included in guidance or in revisions to the LCR.

### 3.2.1 National Lead in Drinking Water Clearinghouse

The LCRWG recommends that EPA take the lead, working with other partners to establish a national, accessible information clearinghouse. The LCRWG suggests that this information clearinghouse include a website, that the materials on the web site be accessible for distribution through the Safe Drinking Water Hotline for those who may not have internet access, and that EPA investigate and apply newer communication technologies and ideas for interactive or other innovative means of communication with the public about lead in drinking water (e.g. social media methods and outreach programs).

The clearinghouse should include information in multiple languages, in clear terms understandable by the public, and should include engaging, reader-friendly graphics, photos, and video. EPA is encouraged to include the design of the clearinghouse in its consultation with people with diverse, and consumer-oriented expertise and perspectives described above.

Such a clearinghouse would be intended for use by the general public, PWS's, public health agencies, and health professionals. It should include:

- information and educational materials for the public that the public could access directly and that PWSs could use to meet many of the public education requirements of the LCR.
- guidance and templates, particularly for small systems, on SOPs for compliance with the LCR (e.g. templates for communicating lead monitoring results to individual customers, templates for explaining to customers how to obtain information on whether their service line could be lead, templates for standard operating procedures related to the LSL replacement program recommendations above, etc).
- Principles and guidelines for best practices in developing the content of the public education materials.
- Case examples of how communities have been successful in lead inventory updates and removal programs, information about funding sources, model ordinances or other types of authorities PWSs have to enable them to implement full LSL replacements, and contacts to other relevant agencies.

Further, EPA should consider best practices in methods for achieving greater public awareness of the clearinghouse so that it reaches as many people as possible.

The web site should include the following information:

#### Health risks

- Clear and prominent statement that no level of lead in drinking water is safe for human consumption and that a short-term exposure to a young child can result in permanent harm to the brain if the levels are high enough.
- Clear and distinct language on the health risks of consuming lead in drinking water
- Identification of the most vulnerable populations
- Importance of drinking water plumbing as a lead source
- How to have blood lead levels (BLLs) checked and limitations of testing
- How to have water tested and limitations of testing
- List of labs for testing water other than the utility and what to ask for in terms of number and size of bottles, diameter of mouth of bottles, analysis that measures lead particles, etc.

#### Forms of lead in water and health risk implications

- Soluble
- Particulate
- Unpredictability of lead release

#### Sources of lead in drinking water

- LSLs
- Other lead-bearing plumbing
- Scale on internal plumbing that can be a source of lead from present or past LSLs

#### Identification of service line material

- How to recognize a pipe that is made of lead (and when not to check due to age of home)
- What to do about galvanized pipe and why it is a potential source of lead

#### For homes with LSL

- LSL ownership
- Difference between full and partial lead service line replacement (physically and in terms of health risks)
- Benefits to full LSL replacement
- Actions to take if you have a partially replaced LSL
- Available methods for LSL removal
- Opportunities for removal, approximate cost, and financing options
- Overall benefits to the community of removing LSLs fully (lower treatment costs, better community health, environmental, etc.)
- Where applicable, requirements for notification during real estate transfer or new rental

#### Health-protective actions

- Precautionary water-use practices
- Role of filters and proper maintenance of them if they are used
- Replacement of leaded plumbing with lead-free plumbing

#### Additional information

- How to contact your utility and request a LSL inspection and/or water test
- Where applicable, reference to utility-specific website with local lead-related documents and data (e.g. Consumer Confidence Reports (CCRs), sampling protocol used for LCR compliance, lead-in-water test results, etc.)

- What you need to know about lead in water in schools and day care centers (it is not regulated, and link to national website that provides more information)
- Reference to a national website that provides a video version of basic educational information, including information on how the LCR works (with minority language versions)
- Other standard operating procedures, model ordinances, or templates for compliance with the revised LCR
- Where to get more information on drinking water, on lead in water, and on lead in general

### 3.2.2 Outreach to New Customers

The LCRWG recommends that a revised LCR require PWSs to provide information to all<sup>6</sup> new customers in a letter or via other direct means on the potential risks of lead in drinking water.

The outreach materials should include information about the potential for lead from plumbing materials to contaminate drinking water even when a PWS meets the LCR LAL, to contaminate drinking water in homes with and without LSLs, and to pose chronic and acute health risks to vulnerable populations. The specific information to be covered in those materials could be included in the consultation with the diverse group of experts as described in the introduction to Section 3.2 above and in Section 4 below. Although the LCRWG defers to such a group, it suggests that at a minimum the following topics be covered:

1. Information about lead in drinking water (its sources, variable and erratic release, and wide range of lead concentrations)
2. Information about the health effects of lead in drinking water (including chronic and acute health risks)
3. Information about the LCR's shared responsibility regime
4. Actions the PWS is taking to minimize lead in drinking water
  - PWSs with LSLs would mention their proactive LSL replacement program
5. Steps consumers can take to reduce exposure to lead in drinking water
  - In addition to a list of actions like the ones mentioned in the current Rule, PWSs with LSLs would spell out how consumers in homes with a LSL can participate in their proactive LSL replacement program
6. Phone numbers and online links for additional information (including a link to EPA's online National Clearinghouse)

The outreach to new customers should be delivered within 30 days or with the first bill.

### 3.2.3 Revise the Current CCR Language

The CCR is a necessary but not sufficient source of information for the public. It can provide general information, but is not designed to be frequent or detailed enough for all public education purposes.

All community water systems (CWSs) should continue to include a statement about lead in their CCR. There may be circumstances (e.g. a subdivision built entirely after January 2014 when "lead-free" requirements came into effect), where a CWS can demonstrate that there are no lead-bearing materials in contact with drinking water. EPA may want to consider allowing the primacy agency to waive this CCR language requirement if an entire CWS can meet this criterion.

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<sup>6</sup> EPA may wish to consider circumstances under which exceptions might be applicable.

The LCRWG recommends that the CCR language should be strengthened to include:

- Public health statements updated to reflect current understandings that there is no safe level of lead and a summary of the health effects, that this risk pertains to everyone, and that some individuals are particularly vulnerable;
- A link to the national clearinghouse should be added to the CCR for all CWSs;
- Recognition that a CWS's compliance with federal regulations does not guarantee what level of lead (lower or higher) might be found at the tap in a particular home; and
- The message that customers play an important role in protecting themselves from exposure to lead.

In addition, the work group recommends that PWSs where full or partial lead service lines exist (or are presumed to exist until an inventory demonstrates otherwise) also add information about what a lead service line is and how to contact the utility for information about how to find out if you have one and why you should replace it.

Further, the LCRWG recommends that the following redraft of the CCR be considered as a starting point for incorporating the elements listed above, to be reviewed by the diverse group of experts that the LCRWG suggests EPA consult .

***Important Information from EPA about Lead*** *If lead is present in your drinking water, it elevated levels of can cause serious health problems, especially for pregnant women and young children. Lead can affect children's brains and developing nervous systems, causing reduced IQ, learning disabilities and behavioral problems. Lead is also harmful to adults. Lead in drinking water is primarily from materials and components associated with ~~service lines and home plumbing and service lines~~ (the pipe connecting your home to the water main). (System name) is responsible for providing high quality drinking water, but cannot control the variety of materials used in plumbing components. Contact us for information about lead service lines, how to find out if you have one and why you should replace it. [Last sentence for systems with LSLs.]*

*When your water has been sitting for several hours, you can minimize the potential for lead exposure by flushing your tap for 30 seconds to 2 minutes before using water for drinking or cooking. Protecting you against exposure to lead is a shared responsibility. Your water utility is required to minimize the corrosivity of the water. However, because every home is different, the amount of lead in your tap water may be lower or higher than the monitoring results for your public water system as a whole. You can take responsibility for identifying and removing lead materials within your home plumbing and taking steps to reduce your family's risk. If you have lead service lines or lead-bearing materials in your home, are concerned about lead in your water, you may wish to have your water tested. Information on lead in drinking water, testing methods, and steps you can take to minimize exposure is available from the Safe Drinking Water Hotline at 1-800-426-4791 or [www.epa.gov/safewater/lead](http://www.epa.gov/safewater/lead). [Insert new national web site link]*

#### 3.2.4 Strengthen Requirements for Public Access to Information

The LCRWG supports the public's right to know about the quality of their water and considered various options to increase the public's access to data related to lead and copper.

Under the current rule, the PWS is only required to make publicly available through the Consumer Confidence Report (CCR) that the "90<sup>th</sup> percentile value of the most recent round of sampling and the number of sampling sites exceeding the action level." 40 CFR 141.153. In many jurisdictions, a



concerned consumer may be able to obtain or view a redacted version of the complete sampling data set but this approach is time-consuming and burdensome on the PWS (or the state) and the community. EPA receives only a summary of the sampling results.

As the LCRWG evaluated different approaches, we kept in mind EPA's Office of Enforcement and Compliance Assurance (OECA) five principles for highly effective regulations and that OECA is working with regulatory programs to evaluate new and revised rules against these principles. Principle 4 calls for rules to "leverage accountability and transparency by providing the government and the public with real-time access to quality information on regulated entities" emissions, discharges and key compliance activities and outcomes." OECA identified two tools to accomplish this:

- Electronic reporting to the government.
- Public accountability via websites, paper/electronic mailings, and other ways to provide the public and stakeholders (e.g., customers, ratepayers) with compliance information.

The LCRWG encourages EPA to use the SDWIS-Prime data system<sup>7</sup> that is under development to meet the first provision of the above goal. Electronic reporting from utilities to a centralized data system would allow the public to access data from the State or EPA in a coordinated manner and allow for consistent access to all water quality data, not just data for lead and copper.

Until such time as the new data system is in place, though, the LCRWG believes that water systems should increase the availability of data to the public. This would include:

- The number of samples over the Household Action Level (described in Section 3.5 below) in the last monitoring period, the highest level found during the last monitoring period, the median levels, and the most recent 90<sup>th</sup> percentile level compared to the "system action level" (renamed from the current action level).
- Requiring water systems to include WQP-related information on their webpage, or in the CCR or some equally accessible manner (e.g., CCT treatment, approved WQP ranges, WQP results from the last monitoring period )
- Encouraging water systems to post additional information on their webpages such as:
  - Public education materials (and link to National Clearinghouse).
  - Sampling protocols the water system provides to customers to use when collecting lead samples and any variations from EPA recommendations.
  - Individual sampling results (with appropriate privacy provisions such as address redaction).
  - Inventory (such as a map) of confirmed and presumed lead service lines.

Where a community has lead service lines, EPA should require PWSs provide a public statement of lead service line ownership and the legal basis of said determination. (See section 3.1.2, point 5 "*Control and Responsibility.*")

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<sup>7</sup> SDWIS is a database for storage about drinking water systems. The federal version (SDWIS/FED) stores the information EPA needs to monitor approximately 156,000 public water systems. The state version (SDWIS/STATE) is a database designed to help states run their drinking water programs. SDWIS-Prime is an upcoming version of this program. The website for SDWIS is located here:

<http://water.epa.gov/scitech/datait/databases/drink/sdwisfed/index.cfm>

SDWIS Reports:

<http://water.epa.gov/scitech/datait/databases/drink/sdwisfed/howtoaccessdata.cfm>

### 3.2.5 Routine Outreach to Caregivers/Health Care Providers of Vulnerable Populations

The LCRWG recommends that a revised LCR encourage PWSs to cooperate in locally appropriate public education programs targeted at caregivers and health providers of the populations most vulnerable to lead in drinking water (i.e., pregnant women, infants, young children, and children with elevated BLLs). The intent of such outreach is to raise awareness among caregivers and health providers about the health risks of lead in drinking water, easy steps to prevent exposure, and the availability of EPA's online National Clearinghouse for further information. It is expected that public education messaging in service areas with LSLs will differ from public education messaging in service areas without such lines.

In conducting outreach to caregivers and health care providers it is important that the message be provided by an organization or individual that carries credibility with those audiences. The LCRWG suggests the way to best ensure that caregivers and health providers hear and respond appropriately to information about lead and drinking water is for water suppliers to participate in joint communication efforts, lead by state health departments, state lead poisoning prevention agencies, and state drinking water primacy agencies. This outreach should be targeted to individuals, organizations and facilities likely to be visited by the vulnerable populations of pregnant women, infants, and young children, such as:

1. local public health agencies;
2. public and private pre-schools, schools;
3. Women Infants and Children (WIC) and Head Start programs;
4. public and private hospitals and medical clinics;
5. pediatricians, obstetricians-gynecologists, and midwives;
6. family planning clinics;
7. local welfare agencies; or
8. licensed childcare centers.

1. The outreach efforts should make use of the information provided in the clearinghouse

Examples of communication vehicles that might be suggested in guidance materials include:

- Development and routine delivery of a joint communication from the PWS (or a group of PWSs) and the City/State to:
  - \* Health providers (e.g., OBGYNs, pediatricians, midwives)
  - \* Childhood lead poisoning prevention professionals/organizations
  - \* Professionals at licensed daycare centers and schools
  - \* Listservs/organizations for pregnant women/parents of infants (e.g., local listservs, environmental health groups, La Leche League, etc.)
- Delivery of educational materials during any water-related work at customer homes
- When lead-in-water levels at individual homes test above the HAL, delivery of information to a) the residents at the home and b) City/State health departments. These materials ought to cover information prescribed in the current LCR for public outreach during a LAL exceedance as well as:
  - \* The lead level detected at the specific home
  - \* What this level means in terms of health risk to vulnerable individuals
  - \* If the PWS determines that the home has a LSL, information about how to participate in the PWS's proactive, full LSL replacement program.

The LCRWG also recommends that EPA, informed by the advice of the diverse group of experts described above and working with CDC, HHS and HUD, develop guidance (and make it available through the National Clearinghouse) on how to develop and deliver effective communication efforts to caregivers and health care providers focusing on ways those individuals and groups can reach pregnant women, parents of infants and young children and those who care for them. The audience for those materials would be state primacy agencies, state or local health departments, and state or local lead poisoning prevention agencies, as well as PWSs.

To support PWSs in the development of feasible, locally appropriate, and successful public outreach programs targeting vulnerable groups on a routine basis, the LCRWG recommends the following: that the diverse group of experts EPA may convene for the development of consumer-centered public education messaging and materials (see introduction to Section 3.2), also develop guidelines and best practices that PWSs can use to create proactive risk communication programs. Echoing extant principles and understandings of effective risk communication,<sup>8</sup> we imagine such programs to involve robust collaboration between PWSs, many of the local public health agencies and organizations listed above, as well as local childhood lead poisoning prevention groups (State-funded and grassroots), environmental health organizations, and key community leaders (e.g., advisory neighborhood commissioners).

#### *Education of public health and health care providers on lead and water issues*

The LCRWG had extensive discussions about the frustration that members of the group had that many in the public health community minimized the risk of lead exposure from drinking water, placed a lower priority on actions to reduce that risk, and frequently provided incomplete or conflicting information to members of the public or patients. This made and continues to make the work of water professionals in motivating appropriate action by customers more difficult. Those in the health sector are highly regarded, and viewed as knowledgeable about all health related topics. Customers will look to them for advice and to validate what they hear from their water provider. Efforts by water systems to reach out to their customers must be appropriately re-enforced by those in the health sector if those efforts are to be successful.

The LCRWG recommends that EPA, CDC, HHS and HUD conduct training and outreach to local health agencies, medical professionals and local and state lead poisoning prevention agencies on:

1. Information about lead in drinking water (its sources, variable and erratic release, and wide range of lead concentrations)

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<sup>8</sup> Lundgren, R. E. and A. H. McMakin. 2013. *Risk Communication: A Handbook for Communicating Environmental, Safety, and Health Risks*. Hoboken, NJ: John Wiley & Sons, Inc.

*Risk Communication in Action*, <http://nepis.epa.gov/Adobe/PDF/6000012U.pdf>

Communicating about Lead Service Lines,

<http://www.awwa.org/Portals/0/files/resources/publicaffairs/pdfs/FINALLeadServiceLineCommGuide.pdf>

Strategies to Obtain Customer Acceptance of Complete Lead Service Line Replacement,

<http://www.awwa.org/Portals/0/files/legreg/documents/StrategiesforLSLs.pdf>

National Conversation on Public Health and Chemical Exposures: Education and Communication Work Group Report, [http://www.utmb.edu/cet/downloads/Natl\\_Conv\\_Edu\\_Comm\\_WorkGroup%20Report.pdf](http://www.utmb.edu/cet/downloads/Natl_Conv_Edu_Comm_WorkGroup%20Report.pdf)

Advancing Collaborations for Water-Related Health Risk Communication,

<http://www.waterrf.org/PublicReportLibrary/91145.pdf>.

2. Information about exposures routes of lead in drinking water to different vulnerable populations, including pregnant women, infants and young children
3. Information about lead service lines
4. Information about the LCR's shared responsibility regime between water system and customer
5. Actions that PWSs typically take to minimize lead in drinking water
6. Steps consumers can take to reduce exposure to lead in drinking water, including removal of LSLs
7. Phone numbers and online links for additional information (including a link to EPA's online National Clearinghouse)

The LCRWG also recommends that EPA work with CDC to incorporate in the CDC's website, educational materials, and materials used by CDC-funded childhood lead poisoning prevention programs nationwide, accurate and up-to-date information about lead in drinking water (its sources, variable and erratic release, wide range of lead concentrations, chronic and acute health risks, the LCR's shared responsibility regime, steps to prevent exposure).

### 3.2.6 Public Education Compliance

#### 3.2.6.a Compliance for New Customer Outreach

Violations:

- Failure to provide information to new customers

#### 3.2.6.b Compliance for CCR

Recordkeeping, reporting and violations: Same as in the current CCR rule, with updated content.

#### 3.2.6.c PE Compliance for Public Access to Information

PWS must provide the public access to information about:

- Number of samples over the Household Action Level, median, 90<sup>th</sup> percentile, and highest level found in the last monitoring period
- CCT treatment, approved WQP ranges and WQP results from the last monitoring period

Violations:

- Failure to make this information available to the public

### 3.3 Improve Corrosion Control

Corrosion Control Treatment (CCT) involves the addition of chemicals (e.g. orthophosphates or silicate) to create a barrier between the pipes and the drinking water, or to modify drinking water chemistry (such as pH and hardness) to inhibit the potential for corrosion. The concept is to manage the treatment system to reduce corrosion (and, thus, the release of metals such as lead and copper) from the distribution system and premise plumbing.

Under the current LCR, PWSs serving more than 50,000 people were required to work with their primacy agency (typically the state) from 1994 to 1997 to designate and install optimal corrosion control treatment. Systems serving 50,000 people or less must optimize corrosion control treatment only if the

results of lead and copper tap sample exceed the action levels. A PWS exceeds the lead AL if ten percent or more of the tap samples collected are greater than the 15 ppb action level.

In evaluating CCT choices, a PWS must consider list of assessment parameters; and, as part of the approval of a PWS CCT plan, the state also approves a shorter list of process control parameters applicable to that system to demonstrate that the selected treatment is being properly operated over time. For purposes of this report, the term water quality parameters (WQPs) applies to these latter process control measures. Recommendations concerning WQPs are included in Section 3.4.

Based on the experience with current LCR requirements provided to this work group and shared by work group members, the LCRWG has concluded the following:

- CCT remains an important component of the LCR, in that it is intended to achieve a water quality that minimizes dissolution of lead and copper in water.
- Effective CCT varies based on the specific conditions from system to system. Increased knowledge about CCT since promulgation of the current LCR, if applied today, could lead to improvements in CCT in some systems. Thus, PWSs and their primacy agency should apply the most current science, tailored to the unique circumstances of each system, to the choice of treatment plan and its associated water quality parameters. A variety of factors affect the dissolution of lead in water, including but not limited to pH and alkalinity. Factors other than the stability of designated WQPs can include, among others, the formation/dissolution of protective scales; the presence of manganese, iron, chlorides, sulfates, aluminum and other materials; and temperature. Variations in water quality also can occur within the distribution system. These water quality conditions vary among PWSs, which in turn affect the CCT choices a PWS must make in the context of other regulatory requirements.
- Lead also occurs in different forms in plumbing systems, from soluble to insoluble and particulate in nature. Sources of lead vary from the very common leaded solder and brass fixtures/valves, to LSLs, and to less common lead-lined iron pipe. CCT is more effective in reducing exposure to soluble lead than it is for particulate lead, although CCT that contributes to the formation of certain scales may also provide benefits in reducing exposure to particulates. Thus, while very important, CCT is not the only lead control mechanism that a PWS must have in place. In other words, CCT should not be relied upon by itself to control lead in water. Rather, it should be one of a tool box of other required mechanisms depending on a PWS's particular conditions and lead sources (e.g. LSLs, leaded solder, leaded brass, etc.). These tools are described in other sections of this report and include: LSL replacement (as well as the replacement of other less common sources of lead such as lead-lined iron pipe), current and future use of lead-free materials, stronger public education including targeted public education to vulnerable populations (pregnant women and families with infants and young children), availability of certified POU filters, instructions on how to flush plumbing systems when lead could be disturbed, etc.

#### 3.3.1 Corrosion Control Recommendations

The LCRWG recommends that:

- EPA release a revised CCT guidance manual as soon as possible and update this manual every six years, so that PWSs and primacy agencies can take advantage of improvements in the science;
- EPA provide increased expert assistance on CCT to PWSs and primacy agencies;
- The LCR continue to require re-evaluation of CCT when a PWS makes a change in treatment or source water;

- The LCR continue to require WQP monitoring to ensure that the CCT is achieving the treatment objectives and that EPA consider requiring such monitoring on a more frequent basis with additional guidance on process control methods; and
- Large systems review their existing CCT plan in light of current science in a newly revised guidance manual with their primacy agency to determine whether the WQPs reflect the best available current science. The LCRWG suggests that this review be done every six years following EPA's six year rule review cycle, and subject to there being sufficient science change that EPA updated the guidance manual. EPA should plan to review and refresh Agency guidance every 6 years, subject to significant improvement in the state of knowledge, to allow research to inform rule implementation. In addition, regularly revised guidance would help states and systems stay current with corrosion control science as they respond to problem situations, but more importantly help them anticipate challenges as new water sources and treatments are brought on line, or they contemplate further refinement to corrosion control. Small and medium sized systems should work with their primacy agency to determine whether updates to CCT guidance is applicable to them.

### 3.3.2 Corrosion Control Compliance

PWS must maintain records that it reviewed new EPA guidance manuals and assessed whether and, if so, what changes to CCT are applicable, based on the current state of the science.

#### Violations:

- Failure to notify and consult with primacy agency on re-evaluating CCT if the PWS makes a change in treatment or source water
- Failure to review CCT when EPA updates the guidance manual (for large systems)
- Failure to act if state notifies them that they should assess CCT or make adjustments, based on state review of guidance manual (for medium and small systems)

### 3.4 Modify Monitoring Requirements

Under the current LCR, a PWS is required to conduct monitoring to assess the effectiveness of its corrosion control treatment (CCT) and trigger additional actions to reduce exposure when necessary. Water systems must compare sampling results to an Action Level (AL). The AL for lead is 15 µg/L and the AL for copper is 1.3 mg/L. In the Lead and Copper Rule (LCR), water systems must prioritize sample site locations (often residences) within the distribution system which are at a high-risk of elevated lead and/or copper in the water. Selection and use of these elevated lead and copper sites enables a smaller number of sample sites than random or geographic site selection procedures.

Implementation of this approach over time has revealed numerous challenges. Recruitment of customers to take in-home samples can be difficult and costly. Customers are not professional samplers and, thus, may implement the sampling protocols inconsistently. Research on sampling protocols also has shown that sampling results may vary, and not necessarily consistently, based on the configuration and length of lines from the water main to the sampling tap and whether the sample is a first draw or a subsequent sample intended to reflect water that had been in a LSL for some time.

The LCRWG recommends two types of on-going monitoring: 1) a more robust WQP monitoring program to improve process controls for CCT, and 2) voluntary customer initiated tap water sampling coupled with a more robust and targeted public education program to encourage sampling, in part to provide direct

information to consumers that they can use to reduce potential exposures to lead from drinking water in their home and to provide ongoing information to the PWS to identify and correct unanticipated problems.

The LCRWG also recommends that EPA establish criteria for a PWS to transition from the current rule framework into the new rule framework. The LCRWG recommends that the transition includes a condition that a PWS must comply with the requirements of the current LCR until the PWS has achieved three rounds of monitoring results under the lead AL using the current LCR requirements. Results from past rounds of monitoring can be used or new data will be required if prior data are above the AL. At that point, the PWS can define their CCT or WQPs for the new rule as that which was used to achieve this record. The existing lead AL should be redefined as a System Action Level in the new rule wherein it will be used when determining re-optimization, e.g. for use during a review of a new source or treatment, if the state determines that additional utility tap sampling is warranted. In other words, it will provide a baseline target for confirming CCT if lead sampling is chosen as one means by which to determine CCT. PWSs must continue to demonstrate that they are maintaining the WQPs used to establish the transitions. All systems, regardless of their lead AL status, should be required to transition to the new LSL replacement program and public education program requirements of the revised LCR as of the effective date of the new rule.

#### 3.4.1 Water Quality Parameter Monitoring

As noted above, WQP monitoring is distinguished from the more extensive list of parameters that a water system would consider as it evaluates corrosion control technology choices. WQPs for the purpose of this section involve the on-going process control monitoring that demonstrates that the selected treatment is being properly operated over time.

The WQP program recommended below builds on what is in the current rule by recommending:

- 1) more frequent monitoring than currently required and monitoring that is representative of the distribution system (e.g. at points currently used for DBP monitoring or at a subset of points used for TCR monitoring) to capture currently undetected variability;
- 2) continuing to tailor WQPs to the individual PWS CCT plan and asking EPA to review and consider adding to the list of WQPs referenced in the LCR, based on EPA's anticipated revision to the CCT guidance manual;
- 3) that WQP monitoring be periodically revisited based on the advancing science as documented in research reports and disseminated through periodically revised EPA guidance manuals; and
- 4) that a more rigorous data review process such as control charting and similar process control techniques be used to take advantage of the collected data to improve the consistency of operation, encourage fine-tuning of processes, reduce variability of water quality within the distribution system and detect and manage excursions.

In addition, these data should be reviewed whenever there is a change in source or treatment (see 4.3 above); and, when a system or state primacy agency sees significant changes in WQP data, it should initiate a "find and fix" process, looking for what changed and why, and requiring the PWS make any needed adjustments or corrections. This provides one type of reality check and correction not explicitly in the current LCR.

In addition, the LCRWG recommends that systems which are not currently practicing CCT under the LCR but have been under the lead action level by virtue of either naturally non-aggressive source water or by virtue of other aspects of treatment in use, be required to conduct a WQP monitoring program to

continue to demonstrate that the characteristics which caused them to be non-corrosive are continuing to be in place.

### 3.4.2 Tap Sampling for Lead

The LCRWG also recommends that a voluntary customer-initiated sampling program based on the more robust and targeted public education efforts being recommended elsewhere in this report be substituted for the current LCR tap sampling requirements. .

The results of the voluntary tap sampling program will be used for three separate purposes:

- informing and empowering individual households to take action to reduce risk,
- reporting to health officials when monitoring results exceed a “household action level” (see section 3.5) and
- ongoing information to the utility to assess effectiveness of CCT.

#### *Information for Households*

Data from customer-initiated sampling will be valuable in informing and empowering individual households and thus provide greater customer service. All data provided to customers would need to include appropriate information about the variability of lead levels, that a single sample does not represent all water quality, and that levels at a particular tap at a particular time might be higher or lower. The transmittal should also provide appropriate information about the risks of lead exposure, sensitive populations, and actions the consumer can take to minimize risk.

This type of sampling is currently discouraged by the current rule because water systems are often concerned that “complaint” or “customer” samples would be included into the required 90<sup>th</sup> percentile calculation with potential mandatory response actions if it exceeded the action level. This resulted in system not offering sampling or having the samples be analyzed through a private lab (and therefore the data would not be available for any utility management or regulatory purpose). Currently, PWSs are mandated to return to the same locations which, while it may have value for other reasons, means that many other households do not get the opportunity to understand their lead exposure. Voluntary customer-initiated sampling can also capture data from multi-family residences, which is not included in the mandatory LCR sampling in most cases. A new approach could achieve greater customer service and more data to understand and manage lead corrosion.

Outreach to encourage customers to sample will likely involve many different customer contact opportunities including the CCR, outreach related to having a LSL, outreach related to construction contracts, new customer contact, community meetings, other educational outreach efforts, and whenever a customer contacts the CWS for a water quality question or complaint.

Customers should be given the opportunity to determine the type of information they are interested in, thus should be offered a menu of sampling protocols, e.g. a random daytime sample to determine typical exposure levels, first draw to determine the effects of a brass faucet, or a timed or temperature determined sample from within a service line. The National Clearinghouse should include templates with instructions for each type of sample.

#### *Information for Public Health Officials*

Data from customer samples which exceeded the “household action level” recommended in section 3.5, would be required to be forwarded to health officials. While LCR tap water results are currently provided to the collecting household, the LCR does not require any action for individual high samples, and there is



no mandate to refer to health authorities. While the LCR cannot guarantee actions by health departments, this recommendation provides direct health intervention in those cases where sampling indicates high lead levels.

#### *Information for Assessing the Effectiveness of CCT*

The third use of the customer tap sampling data is to provide on-going information to the utility of potential changes in the effectiveness of CCT. Under the current rule, most systems are sampling for one four-month period every three years. Any changes or variability in lead levels at the tap during the other 32 months of that period are missed. Under this proposal, it is anticipated that there would be a more regular stream of data from more locations, providing information which can be used to understand system performance. The data would be provided to the state primacy agency and presented as time series data to facilitate identifying any changes in the data over time. Small systems might report the data on something as simple as a spreadsheet chart, while larger systems might use more sophisticated analytical methods to understand and use the data.

Unexpected or unexplained changes in the tap sampling data can be used in a “find and fix” approach to identify and respond to potential problems. This could be system initiated or in response to periodic review of the system data by the primacy agency, such as during a sanitary survey. This provides a reality check on whether something unexpected is happening within the distribution system, even though consistent treatment was maintained. The more robust (in both temporal and geographic distribution) of the customer sample data set provides a more powerful check on treatment than the current episodic sampling does.

Specifically the LCRWG recommends that the revised rule require that:

- any customer sampling data be reported to the state on a routine basis and include which of the menu of sampling protocols referenced above was used;
- data be provided as soon as possible and no later than within 30 days to the customer and, if over the household action level, to the health department (as discussed above and in section 3.5);
- the PWS maintain the data set for analysis and review, taking type and location of each sample into consideration, to identify trends and changes in the data;
- the data be available for public review as described in section 3.2.4;
- the PWS and the state review the data and trend analysis during sanitary surveys;
- annually, at the discretion of the primacy agency, the PWS provide the primacy agency with a data summary report of the three most recent years of all tap sampling data, the specific details of which should be determined by EPA;
- if the three most recent years of customer sampling data show that the 90th percentile (running three-year calculation) is above the System Action Level, then the PWS must analyze any changes or trends in the data to evaluate whether they are based on system-wide, local, or household-based conditions, and provide the report and analysis to the state for their review and determination if additional analysis, re-evaluation of CCT, or other actions such as household-based actions (LSL removal, education about lead-free faucets and flushing after non-use of water, etc.) are appropriate.
- if the system makes any source or treatment changes, the PWS and state should use the customer sampling data in the consultation, review and approval by the State currently required by the LCR.

The LCRWG also recommends that EPA provide guidance to states and PWSs on additional forms and types of data analyses which can be conducted on sampling data to provide more detailed understanding

of trends and to support system decision making on customer actions, treatment evaluations or development of system plans and priorities for LSL replacement programs.

It seems appropriate to include some sort of floor to the number of customer samples. Some members of the group suggested that systems should be required to collect no fewer samples in a three year period than they would under the current three-year reduced monitoring requirement.

When a system changes its source or treatment, and is required to consult with the state, the state primacy agency also may choose to require additional one-time monitoring to evaluate those changes if the degree of the change warrants.

Some members suggested that some small systems might want the opportunity to maintain the current home tap water monitoring program. The revised LCR should allow this, while not discouraging customer sampling.

### 3.4.3 Sample Invalidation Criteria

Under the existing regulation (141.86 (f)(1)), "The State may invalidate a lead or copper tap water sample if at least one of the following conditions is met.

- (i) The laboratory establishes that improper sample analysis caused erroneous results.
- (ii) The State determines that the sample was taken from a site that did not meet the site selection criteria of this section.
- (iii) The sample container was damaged in transit.
- (iv) There is substantial reason to believe that the sample was subject to tampering."

These are all good and necessary reasons for invalidating a sample and should be retained, but because this list is limited, samples must be accepted that are obvious "outliers" and don't represent the water that is normally consumed and should not be used as a basis for treatment changes or public education. This is especially true for small systems where the limited number of samples required means that a single, unusually high, value can cause the Action Level to be exceeded. This could lead to installation of expensive treatment when treatment is not needed or adequate corrosion control is already being provided. While probably not as frequent, non-representative samples could also cause water systems to be below the action level when treatment changes really are needed. Good invalidation criteria can help states address both problems.

The purpose of the invalidation is to make sure that decisions are based on the most representative set of samples possible and to do so through a process that provides adequate information to make good invalidation decisions and assures documentation of the reasoning behind the invalidation.

The following is a proposal from states that will serve those two functions.

States believe that the essential criteria for invalidation are already well stated in the Revised LCR Monitoring and Reporting Guidance (EPA 816-R-10-004, March 2010) or the October 2006 memorandum on Management of Aerators During Collection of Tap Samples to Comply with the Lead and Copper Rule. The LCRWG recommends that EPA take the following into account when revising the proposed rule and expand the invalidation criteria accordingly:

- Make sure the sample is taken at a tap that is used regularly, and not an abandoned or infrequently used tap."
- "If first-draw samples are collected at single-family residences, the sample must always be drawn from the cold-water kitchen tap or bathroom tap."

- “If first-draw samples are collected from buildings other than single-family homes, the sample must always be drawn from an interior tap from which water is typically taken for consumption.”
- “Public water systems should not recommend that customers remove or clean aerators prior to or during the collection of tap samples for lead.”

#### 3.4.4. Monitoring Compliance

PWS must monitor and report based on water quality parameters and schedule set by state primacy agency, and use the data for on-going treatment process control (3.4.1)

##### Violations:

- Failure to monitor as per schedule
- Failure to maintain data, and use in process monitoring (to be evaluated by state during sanitary survey inspections or as state primacy agency requests)
- Failure to report data to state
- Monitoring results outside the WQP range established in the PWSs CCT plan along lines similar to current rule requirements

PWS also must include an offer to customers in all LCR related outreach to collect a sample, including in all LSL outreach efforts. PWS must also:

- collect sufficient number of samples, either by customer request or utility initiated sampling, i.e. no fewer samples in a three year period than under the current three-year reduced monitoring requirement, assuming the PWS qualifies for such reduced monitoring;
- promptly report the data to the customer, the state and local PH (if above health action level); and
- use the data as part of on-going evaluation of CCT performance, monitoring for changes in lead levels at the tap over time, geographic trends in levels, and interaction with distribution system water quality.

##### Violations:

- Failure to offer to sample
- Failure to collect minimum number of required samples within 3-year window
- Failure to report data to:
  - Household
  - State
  - Local public health agency (if above household action level) no later than 30 days after the result was received
- Failure to provide rule-required information in sampling offer materials, or in household reporting of the data
- Failure to use household tap sampling data in on-going evaluation of CCT and maintain record of having done so, (as determined by state during sanitary survey inspections or as state primacy agency requests)

### 3.5 Establish a Household Action Level

The current lead action level is based on the 90<sup>th</sup> percentile of the collected samples. Without a maximum limit, some users may be exposed to levels of lead in the drinking water that presents a potentially significant health threat, especially to children, without exceeding the action level.<sup>9</sup> If the levels are high enough and state and local authorities do not act, EPA could determine that the levels pose “an imminent and substantial endangerment to the health of persons” pursuant to section 1431 of the Safe Drinking Water Act. (40 USC 300i)

#### 3.5.1 Household Action Level Recommendations

To avoid the possible need to invoke section 1431 of the SDWA, the LCRWG recommends that EPA establish in a revised rule a “household action level” and require the PWS to notify the local health department and state drinking water authority of sample results over that level. The requirement would be triggered by any sample results that the PWS receives from a user or from its own monitoring. However, the PWS would not be required to make the notification until it has investigated the sample in a timely manner to eliminate sampling or assay errors.

The existing rule already requires the PWS to notify residents of the results of water system conducted lead sampling. We would anticipate that the PWS would alert the resident to possibility that the health department may be notified when the sample was taken or the resident provided the PWS with the sample results. While this notice may have the unintended consequence of discouraging some customers from testing, it is important for the customer to make an informed choice.

In response to the notification, the PWS and the health department would consider the situation and take action that they deem appropriate (e.g., testing children’s blood, recommending a filter, discussing lead service line replacement with the resident or landlord, advising grandparents about risk to visiting children, or continuing to monitor the situation). We anticipate that the health department be the lead agency, and that the rule would not prescribe actions other than notice as the situations are too diverse and complicated for prescription actions. The LCRWG encourages EPA to work with the Centers for Disease Control and Prevention on recommended approaches and make this information available through the clearinghouse discussed in section 4.2.

This requirement would be somewhat similar to the regulatory approach taken by the Department of Housing and Urban Development which mandates that public housing authorities notify the local health department within five days when it receives information from any source that a child of less than six years of age living in an assisted dwelling unit may have an environmental intervention blood lead level. (24 CFR 35.1225)

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<sup>9</sup> The LCRWG discussed the relationship between the household action level and the current lead AL (to be renamed the system action level). These levels have two distinct purposes. The LCRWG assumed during its discussions that the household action level would be significantly greater than the system action level. It recognized, therefore that, depending on what level is set, the household action level may have impacts on other recommendations in this report.

We recommend that EPA set the household action level based on the amount it would take for an infant to have a blood lead level greater than five micrograms per deciliter ( $\mu\text{g/dL}$ ) based on consumption by an average, healthy infant of infant formula made with water. When a child's blood lead level exceeds five  $\mu\text{g/dL}$ , the Centers for Disease Control and Prevention (CDC) recommends that laboratories and health care providers notify local and state health departments and that action be taken to identify and prevent further exposure.<sup>10</sup>

### 3.5.2 Household Action Level Compliance

If household sample exceeds the household action level, PWS must promptly notify the household and the local public health agency; certify that this has been done, and maintain records of having done so.

#### Violations:

- Failure to report data no later than 30 days after the result was received, to
  - Household
  - Local public health agency
- Failure to certify to state that data was reported to the household and to the local public health agency within 30 days
- Failure to maintain records of correspondence between PWS and the local public health agency,

### 3.6 Establish Separate Monitoring Requirements for Copper

The current LCR does not deal effectively with copper. Generally speaking, the current rule focuses on the health benefits associated with lead risk reduction, with the result that the currently required in-home sampling is often done in locations with old copper that has passivated. Thus, the possibility may be missed that a system's water chemistry could result in copper releases. Further, the current rule does not require public education for copper, which can have broad benefits.

The LCRWG has concluded that the regulatory approach should separate lead and copper risk management, refocusing attention to where there may be a problem with copper without increasing the burden on systems where there is not a problem. This can be achieved in a cost effective manner by targeting copper monitoring requirements to those PWSs where there may be exposures.<sup>11</sup>

Elevated exposures to copper generally result from new copper plumbing<sup>12</sup> where water chemistry is aggressive to copper. It is technically possible to identify water chemistries that are aggressive versus not aggressive to copper. Thus, the LCRWG recommends that the requirements for copper monitoring focus first on sampling for basic finished water quality parameters such as pH, alkalinity, and orthophosphate in a way that is representative of the distribution system to identify waters that are aggressive to copper. Systems that can demonstrate that their finished waters are not aggressive to copper or that their

<sup>10</sup> [http://www.cdc.gov/nceh/lead/ACCLPP/blood\\_lead\\_levels.htm](http://www.cdc.gov/nceh/lead/ACCLPP/blood_lead_levels.htm)

<sup>11</sup> The LCRWG recommends this approach, assuming EPA determines that the health benefits of regulating copper justify the costs. A full health risk assessment for copper was beyond the scope of the LCRWG's charge, however; and, thus, EPA's analysis of whether benefits justify the costs may have implications for these recommendations.

<sup>12</sup> New copper is generally understood to be between six months to three years of use.

distribution systems contain no copper should have no further copper monitoring requirements. This could be written into the rule, rather than require a monitoring “waiver.”

### 3.6.1 Copper Recommendations

Further, the LCRWG recommends that the LCR be revised based on the following concepts:

1. Instead of basing action on the results of routine, in-home copper sampling, actions should be based on the aggressiveness of the water to copper. Systems can determine if their water is aggressive to copper by doing WQP monitoring in the distribution system. All PWSs should be assumed to have water that is aggressive to copper unless they demonstrate that it isn't.
2. EPA should develop criteria to define water that is not aggressive to copper for the purpose of establishing whether a system falls into that category (or “bin”) for the purposes of the LCR. EPA should consider the accuracy and potential variability of pH and alkalinity monitoring as well as corrosivity to copper in establishing pH and alkalinity ranges. The criteria also should include consideration of passivation time. Examples of bins (for verification by EPA) would be:
  - a. if alkalinity is < 35 pH must be > 7.0 ( no upper pH limit)
  - b. if alkalinity is 36 to 100, pH must be > 7.2
  - c. if alkalinity is 101 to 150 , pH must be > 7.5
  - d. if alkalinity is 151-250 , pH must be > 8

If orthophosphate is used, examples of bins would be:

- a. if alkalinity <150, PO<sub>4</sub> must be >1 mg/L
  - b. if alkalinity is 150 to 200, PO<sub>4</sub> must be > 2 mg/L
  - c. if alkalinity is 200 to 240, PO<sub>4</sub> must be > 3 mg/L
  - d. if alkalinity is greater than 240, PO<sub>4</sub> must be > 3.3 mg/L
3. PWSs can choose one of several approaches to demonstrate that their water is not aggressive to copper:
  - a. Conduct water quality parameter monitoring to assess whether their water meets the definition established by EPA.
  - b. Conduct a one-time evaluation with copper sampling at vulnerable houses (houses < 2 years old with new copper plumbing) to demonstrate that water chemistry is non-aggressive (copper levels fall under the AL/SMCL). EPA may want to consider:
    - i. Limited number of sample sites needed given copper chemistry
    - ii. Provision for sample invalidation based on site-specific conditions such as biologically-induced corrosion.
  - c. Conduct a pipe loop study to demonstrate the water chemistry is non-aggressive
  - d. Change water chemistry to within the range established for non-aggressive water quality
4. PWSs with water **classified as non-aggressive to copper** must continue to demonstrate that the water is non-aggressive. PWS's can choose to:
  - a. Maintain those WQPs that demonstrate it maintains non-aggressive water under (2) above, or

- b. Conduct copper sampling at vulnerable houses (houses < 2 years old with new copper plumbing) to demonstrate that water chemistry is non-aggressive (copper levels fall under the AL/SMCL)

PWSs that are not able to maintain their WQPs must implement a public education program as described in the next section.

- 5. PWS's with water **classified as aggressive to copper** must initiate and maintain a public education program. The public education program must either provide:
  - a. Information to all new homes (new construction or change of service) upon initiation of new service
  - AND
  - b.
    - i. Information to newly renovated homes at time of renovation
    - OR
    - ii. Information to all customers on a routine basis

In addition, in guidance, EPA should encourage PWSs to notify contractors, plumbing suppliers, and plumbers of copper corrosivity and to work with relevant officials and organizations to consider building and plumbing code changes that would prohibit copper piping in new construction if the corrosive water conditions cannot be eliminated. EPA also should provide guidance and/or templates, particularly for small systems, for public education messages and modes of delivery.

- 6. EPA should consider whether or under what circumstances CCT should be required for a PWS **classified as aggressive to copper**. Not all systems with water aggressive to copper necessarily will have homes with new copper, so treatment might not be necessary or perhaps even advisable, particularly for small systems that can control plumbing materials used or for systems in communities that modify their plumbing codes. Passivation time of copper varies considerably, and CCT may not be necessary or advisable when passivation time is short if interim actions to protect public health other than CCT are feasible. In determining when CCT should be required and any associated monitoring requirements, EPA also should take into consideration that a PWS may not have access to information about renovations where new copper has been installed and, even when such information is available, can't control whether the customer will participate in a monitoring program. Setting the correct level and establishing a regulatory approach that triggers CCT only when necessary will require a complex assessment and is beyond the scope of this workgroup.
- 7. In the revised LCR, systems should continue to be required to notify the primacy agency if they are making any long-term treatment change or addition of a new source. This section of the rule should be made clear that for copper, the system may be required to demonstrate that its finished water continues to be non-aggressive to copper (per 4 above).
- 8. Additional information needs to be gathered on the current distribution of pH, alkalinity, and phosphate residual among systems nationally to fully understand the implications of this approach.

### 3.6.2 Copper Compliance

#### Violations:

- Failure to implement public education, for PWSs that have not demonstrated their water chemistry is not aggressive to copper.
- Failure to maintain a monitoring program representative of the distribution system that demonstrates the system has water chemistry not aggressive to copper.
- Failure to provide notice to and, if required, consultation with the primacy agency, when a PWS makes a significant change in source or treatment (as in the current LCR).
- Failure to implement CCT or other risk reduction actions prior to CCT as determined by the primacy agency.

## 4 Complementary Actions Critical to the Success of the National Effort to Reduce Lead in Drinking Water

The LCRWG urges EPA not only to promulgate a revised LCR, but also to play a leadership role in educating, motivating, and supporting the work of other agencies, where EPA does not have the authority to act. The LTR LCR is very important. However, removing lead from drinking water systems and reducing exposure to lead from drinking water in the meantime will require renewed commitment, cooperation and effort by government at all levels and by the general public.

Specific recommendations for action in addition to the LTR LCR include (grouped generally by who might take such actions):

#### EPA Actions

- EPA working across all offices to take an integrated approach to action and education on lead from all sources (paint, air, site clean-up, etc.), with proper emphasis on lead in drinking water, especially in relation to the populations most vulnerable to this source (pregnant women, infants and young children). For example, OGWDW should coordinate with EPA's lead-based paint program so lead hazards are communicated consistently.
- Work with other federal agencies including HUD in terms of lead programs including but not limited to expanding federal funding from those programs to include lead service line replacement; HUD/DOT in terms of efficiency in possible coordination of lead service line replacement with road projects and other construction projects; and CDC in terms of childhood lead poisoning prevention, screening, and protection programs
- Enhanced cooperation with state, county, and local health departments to promote an integrated approach to childhood lead poisoning screening, prevention, and protection that emphasizes drinking water and its potential as a primary lead source (e.g. infants dependent on reconstituted formula).
- EPA needs to work with agencies at all levels of government to support financial assistance programs for LSL removal. Building costs into a PWS's capital budget planning should also be a consideration.
- EPA should include diverse perspectives in its stakeholder engagement programs, including affected consumers (who should not be required to be members of formal organizations), lead poisoning prevention/clean water advocates, EJ advocates, lead/copper corrosion experts, and



representatives from PWSs, States, and federal agencies with Healthy Homes and childhood lead poisoning prevention programs.

#### Other Federal Actions

- A federal tax deduction to support replacement of the customer portion of LSLs.
- EPA should work with CDC and HHS to ensure that the standard protocol for investigation of any child with elevated blood lead levels or of a home with lead levels above the HAL include determination of whether there is a lead service line.
- EPA should work with HHS and HUD to modify funding guidelines for the Healthy Homes and other federal funding programs to explicitly authorize and prioritize the use of those funds for lead service line removal programs targeting the privately owned portion of any lead service line. The current situation of having tens of thousands of dollars spent by a local Healthy Home or lead poisoning prevention program to remove lead paint, and leave behind a lead service line because of arbitrary funding guidelines is unacceptable.

#### State or Local Actions

- Local or state building and plumbing codes, including possibility of prohibiting copper plumbing where water is aggressive to copper.
- State Actions to support customer lead service line replacement, e.g.
  - State legislation requiring inspection or replacement on sale of home
  - Disclosure requirements at sale of home
  - Requirements for LSL removal as part of school and day care licensing
  - Building code requirements for LSL removal upon substantial renovation (could be national action as well)
  - Priority in DWSRF funding, especially if increased funding is available. (Criteria states might wish to consider include: PWSs where there is a high incidence of elevated BLLs for children, a high percentage of homes with LSLs, a high percentage of low income families, the PWSs prior efforts to replace LSLs, etc)<sup>13</sup>
- States should consider including requirements for lead in drinking water in state child care licensing rules.

#### Public Water System Actions

- Options EPA may want to describe in guidance and PWSs could consider include but are not limited to:
  - a. Rate design considerations:
    - i. Low rates for low volumes
    - ii. Household size-based rates

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<sup>13</sup> Good examples of programs which facilitate and enable private action include a Massachusetts program which provides a state income tax credit for the replacement of failing private wastewater treatment systems (septic tanks and leaching fields) coupled with a requirement for inspection and compliance with stricter rules upon property transfer; and many local housing rehabilitations programs funded by Federal Community Development Block Grants (CDBG) which provide low or no interest loans for health and safety related improvements, payable upon property transfer, often with loan sunsets where repayment is not required or the balance is reduced over a period of continued occupancy by an income-eligible homeowner. A similar loan program could be authorized by EPA under the Drinking Water SRF program.

- b. Non-rate policies
    - i. Budget billing
    - ii. Fixture retrofits and plumbing assistance by the PWS
    - iii. Service line replacement and insurance programs not provided by PWS
    - iv. Direct assistance, emergency bill payment relationships
    - v. Fixture retrofits and plumbing assistance by NGO organizations providing affordable housing
    - vi. Subsidies including LSL / connection replacement costs associated with street, sidewalk, and other repairs not related to drinking water infrastructure
    - vii. On-bill financing provided by the PWS
  - c. Funding guidance
    - i. EPA's Financing for Environmental Compliance – Water
    - ii. Tools for Financing Water Infrastructure
  - d. Funding sources beyond rate revenue:
    - i. EPA's Drinking Water State Revolving Fund (DWSLF)
    - ii. EPA Targeted Grants to Reduce Childhood Lead Poisoning
    - iii. USDA's Water and Environmental Programs, U.S. Department of Agriculture, Rural Development
    - iv. HUD's Community Development Block Grant Program – U.S. Department of Housing and Urban Development
    - v. HUD Healthy Homes Technical Studies
    - vi. HUD Office Healthy Homes and Lead Hazard Control Lead Hazard Reduction Demonstration Program
    - vii. HUD Health Homes Initiative Lead Elimination Action Program
    - viii. HUD Office of Healthy Homes and Lead Hazard Control Lead Hazard Control Lead Technical Studies Grant Program
- PWSs should educate and encourage partnerships with healthcare providers and health departments even when levels are below the AL.

#### Research

- Additional technical review and/or additional study is needed on how to conduct household and service line flushing to remove particulate lead.
- Published, peer reviewed research explaining that water in plumbing systems with leaded materials and LSLs can have sufficient levels of lead in the water to be a risk to those consuming the water. This paper is important to gaining support from the public health agencies and others and to placing water in context with other sources of lead.
- Considering that lead remains a complex issue and that research and information gaps still exist, the EPA should establish a Research and Information Collection Partnership to encourage the filling of these gaps in knowledge. The RICP should be initiated once the EPA begins working on the revised rule and continue for three years or more into the promulgation of the revised rule.
- The EPA and other agencies, such as the Water Research Foundation, should conduct research (such as bench scale and limited system case studies) to confirm the bins selected to define aggressive waters for copper. The bins are based on theory and need some level of confirmation prior to promulgating an actual regulation. This work can be done within the timeframe of developing a final rule.

## **5 Conclusion**

The LCRWG appreciates the opportunity to provide these recommendations to the NDWAC, offers our thanks to the experts and members of the public who made presentations to the work group, and wishes particularly to acknowledge EPA for the extensive commitment of staff time and expertise to this process.

## ATTACHMENT A

### NDWAC Lead and Copper Working Group

Members
Christina Baker: Deputy Public Counsel, Office of the Public Counsel, State of Missouri
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Derrick Dennis: Water Quality and Data Management Section Manager, Office of Drinking Water, State of Washington
Stephen Estes-Smargiassi: Director of Planning, Massachusetts Water Resources Authority
Yanna Lambrinidou: Parents for Non-toxic Alternatives <i>[dissenting]</i>
Thomas G. Neltner: Environmental Defense Fund
John Sasur Jr.: Three Rivers Fire District, Massachusetts
Robert C. Steidel: Director Department of Public Utilities, City of Richmond Virginia
June Swallow: Chief, Division of Water Quality, Rhode Island Department of Health
Lynn Thorp: National Campaigns Director, Clean Water Action
Chris Wiant: President, Caring for Colorado
Nse Obot Witherspoon: Executive Director, Children's Environmental Health Network

Table 1: Elements of utility reports by dates in three-year cycle (*based on EPA adoption of rule in 2017)											
Action	2020*	2023	2026	2029	2032	2035	2038	2041	2044	2047	2050
Confirm broad and targeted education programs underway <sup>1</sup>	Yes. If not, then explain.	Yes. If not, then explain.	Yes. If not, then explain.	Yes. If not, then explain.	Yes. If not, then explain.	Yes. If not, then explain.	Yes. If not, then explain.	Yes. If not, then explain.	Yes. If not, then explain.	Yes. If not, then explain.	Yes. If not, then explain.
Status of consumer sampling <sup>2</sup>	NA	# done & # offered	# done & # offered	# done & # offered	# done & # offered	# done & # offered	# done & # offered	# done & # offered	# done & # offered	# done & # offered	# done & # offered
Confirm communication of sampling results <sup>3</sup>	Yes. If not, then explain.	Yes. If not, then explain.	Yes. If not, then explain.	Yes. If not, then explain.	Yes. If not, then explain.	Yes. If not, then explain.	Yes. If not, then explain.	Yes. If not, then explain.	Yes. If not, then explain.	Yes. If not, then explain.	Yes. If not, then explain.
Confirm operation policies in place <sup>4</sup>	Yes. If not, then explain.	Yes. If not, then explain.	Yes. If not, then explain.	Yes. If not, then explain.	Yes. If not, then explain.	Yes. If not, then explain.	Yes. If not, then explain.	Yes. If not, then explain.	Yes. If not, then explain.	Yes. If not, then explain.	Yes. If not, then explain.
Replacement Progress <sup>5</sup>	Initial Baseline	85% remaining	70% remaining	55% remaining	40% remaining	25% remaining	17% remaining	10% remaining	6% remaining	3% remaining	0% remaining
If replacement goals not met, number of checklist items confirmed completed (See Table 2) <sup>6</sup>	Basic requirements [see Section 3.1.2]	Basic requirements	TBD (by EPA)	TBD (by EPA)	TBD (by EPA)	TBD (by EPA)	TBD (by EPA)	TBD (by EPA)	TBD (by EPA)	TBD (by EPA)	TBD (by EPA)

<sup>1</sup> See Section 3.1.2 (item 4 “targeted outreach” EPA to provide a checklist; PWS to contact customers with LSLs individually at least every three years and when there is a new customer at that address.

<sup>2</sup> Number of customers offered opportunity to conduct at-tap samples and number of samples taken.

Confirmation that results were provided to the customer. Number exceeding the household action level and confirmation that the results were submitted to health department. Maintain records for review by the primacy agency.

<sup>4</sup> Program to ensure that emergency, maintenance and renovation operations consider risks of disruption to service line increasing lead exposure to residents. See Section 3.1.2 item 7 (operations).

<sup>5</sup> A service line is presumed lead unless installed after date installation of lead service line prohibited or records or tests by utility confirm entire service line is not lead. Confirming that a service line is not lead counts toward replacement progress.

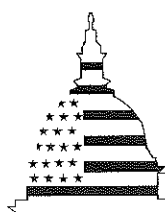
<sup>6</sup> This is a two-fold concept, the details of which the LCRWG suggests be determined by EPA: 1) provide the PWS the flexibility to select outreach methods and other efforts appropriate to that community and 2) increase the number of required efforts to be completed if replacement goals are not met. See Table 2 for checklist of options for additional effort (in addition to the basic outreach requirements).

Table 2 Options (in addition to the basic outreach requirements) to be accomplished by utility if replacement progress goals in Table 1 not met. <sup>1</sup>		
Basic outreach requirements:		
<ul style="list-style-type: none"> <li>Individually notify customers with known or possible LSLs describing the risks of lead in drinking water, specifically inviting them to participate in the LSLR program, offering to have the customer's tap water analyzed, and clearly describing the terms of the program and how to follow up. If the customer does not respond or chooses not to participate, the PWS must follow up with another invitation at least every three years and always when there is a new customer at that address. (see Section 3.1.2 for additional details)</li> <li>Provide a written offer to replace the LSL when work is being done on the water main in the street (with the same information above).</li> </ul>		
Resident engagement	System policies	Other
1. Notice to new customers of need	1. Plumbing code requires full replacement if service line will be disturbed.	1. Local health agency contact with resident.
2. Written offer to replace when main in street rehabbed (customer pays)	2. Grants or low-interest loan funds identified to cover customer costs sufficient to maintain progress for period.	2. Local health agency funding for removal as part of remediation
3. Written offer to volunteer (customer pays)	3. Financing options such as liens on home provided to customers or tax deductions for property owner costs.	3. Media campaign launched
4. Written refusal from customer(s)	4. MOU or other arrangement to implement notification of customers/property owners by other utilities about replacement options if LSL is disturbed	4. Homeowner association(s) send letters to members supporting replacement.
5. Certified letters sent	5. Capital improvement plans target system pipe rehab and replacement to areas with more LSLs	5. Real estate organizations notified of requirement for replacement of LSL on sale or transfer of title
6. In-person call or visit made	6. Service line insurance program revised to include replacement LSLs if damaged or leaking	6. Cooperative outreach efforts with non-profits
7.	7. More aggressive flushing in areas with LSLs to manage iron related lead particles	7. Coordinated outreach with WIC
8.	8.	8. Outreach to plumbers/contractors
9.	9.	9. Outreach to ob/gyns and pediatricians
10.	10.	10. Local ordinance requiring inspection/notification/replacement of LSLs upon sale or transfer of title
11.	11.	11. LSL identification added to home inspector standard operating procedures
12.	12.	12.
<sup>1</sup> EPA will provide guidance on the options and update them periodically as best practices evolve.		

January 2006

# DRINKING WATER

## EPA Should Strengthen Ongoing Efforts to Ensure That Consumers Are Protected from Lead Contamination



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# Highlights

Highlights of GAO-06-148, a report to congressional requesters

## Why GAO Did This Study

Elevated lead levels in the District of Columbia's tap water in 2003 prompted questions about how well consumers are protected nationwide. The Environmental Protection Agency (EPA), states, and local water systems share responsibility for providing safe drinking water. Lead typically enters tap water as a result of the corrosion of lead in the water lines or household plumbing. EPA's lead rule establishes testing and treatment requirements. This report discusses (1) EPA's data on the rule's implementation; (2) what implementation of the rule suggests about the need for changes to the regulatory framework; and (3) the extent to which drinking water at schools and child care facilities is tested for lead.

## What GAO Recommends

Among other things, GAO recommends that EPA improve its data on key aspects of lead rule implementation, strengthen certain regulatory requirements and oversight, and assess the problem of lead in drinking water at schools and child care facilities. In commenting on a draft of this report, EPA generally agreed with our findings and recommendations.

[www.gao.gov/cgi-bin/gettrpt?GAO-06-148](http://www.gao.gov/cgi-bin/gettrpt?GAO-06-148).

To view the full product, including the scope and methodology, click on the link above. For more information, contact John B. Stephenson at (202) 512-3841 or [stephensonj@gao.gov](mailto:stephensonj@gao.gov).

## DRINKING WATER

# EPA Should Strengthen Ongoing Efforts to Ensure That Consumers Are Protected from Lead Contamination

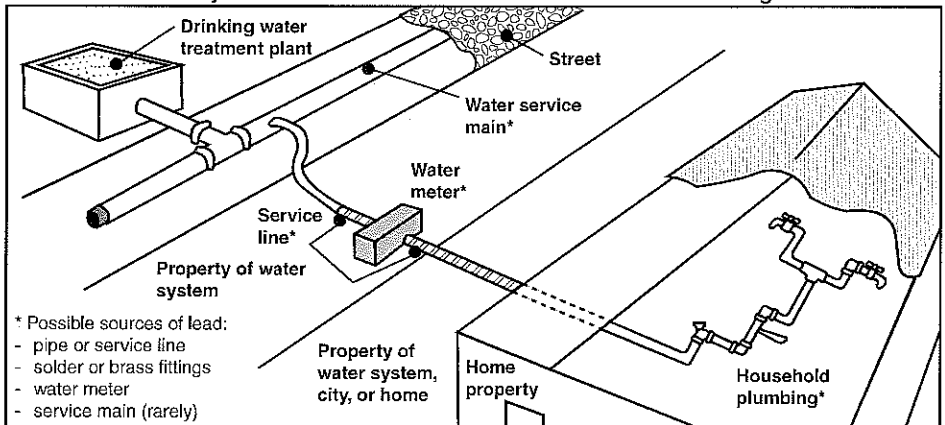
## What GAO Found

EPA's data suggest that the number of drinking water systems with elevated lead levels has dropped significantly since testing began in the early 1990s. However, EPA's database does not contain recent test results for over 30 percent of large and medium-sized community water systems and lacks data on the status of water systems' efforts to implement the lead rule for over 70 percent of all community systems, apparently because states have not met reporting requirements. In addition, EPA's data on water systems' violations of testing and treatment requirements are questionable because some states have reported few or no violations. As a result, EPA does not have sufficient data to gauge the rule's effectiveness.

Implementation experiences to date have revealed weaknesses in the regulatory framework for the lead rule. For example, most states do not require their water systems to notify homeowners that volunteer for periodic lead monitoring of the test results. In addition, corrosion control can be impaired by changes to other treatment processes, and controls that would help avoid such impacts may not be adequate. Finally, because testing indicates that some "lead-free" products leach high levels of lead into drinking water, existing standards for plumbing materials may not be sufficiently protective. According to EPA officials, the agency is considering some changes to the lead rule.

On the basis of the limited data available, it appears that few schools and child care facilities have tested their water for lead, either in response to the Lead Contamination Control Act of 1988 or as part of their current operating practices. In addition, no focal point exists at either the national or state level to collect and analyze test results. Thus, the pervasiveness of lead contamination in the drinking water at schools and child care facilities—and the need for more concerted action—is unclear.

Water Distribution System from the Treatment Plant to Household Plumbing



Source: EPA.



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## Abbreviations

ANSI	American National Standards Institute
EPA	Environmental Protection Agency
LCCA	Lead Contamination Control Act
NSF	NSF International

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United States Government Accountability Office  
Washington, D.C. 20548

January 4, 2006

The Honorable James M. Jeffords  
Ranking Minority Member  
Committee on Environment and Public Works  
United States Senate

The Honorable John D. Dingell  
Ranking Minority Member  
Committee on Energy and Commerce  
House of Representatives

The Honorable Hilda L. Solis  
Ranking Minority Member  
Subcommittee on Environment and Hazardous Materials  
Committee on Energy and Commerce  
House of Representatives

When testing in the District of Columbia during 2003 revealed that over 4,000 households had elevated levels of lead in their drinking water, the ensuing publicity prompted questions about how well local drinking water systems are protecting consumers from lead contamination nationwide. The adverse health effects associated with exposure to lead can be severe, including delays in normal physical and mental development in infants and young children, and damage to kidneys and reproductive systems for the population at large. Although rarely the sole cause of lead poisoning, lead in drinking water can be a significant contributor to a person's total exposure—and can account for as much as 60 percent of the exposure for infants who drink baby formula or concentrated juices mixed with water. Because children are most vulnerable to adverse health effects from lead exposure, the adequacy of controls over lead in water supplies serving schools and child care facilities is particularly important.<sup>1</sup> In response to the discovery of lead contamination in the District of Columbia, the Environmental Protection Agency (EPA) launched a broad examination of the implementation of drinking water regulations it issued in 1991—known as the Lead and Copper Rule—to determine whether elevated lead levels

<sup>1</sup>For purposes of this report, we are referring to day care centers, nursery schools or pre-schools, and school-based after school programs as child care facilities.

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are a national problem.<sup>2</sup> EPA issued the rule as part of its efforts in implementing the Safe Drinking Water Act, and established testing and treatment requirements to control lead and copper in public water supplies.<sup>3</sup>

Responsibility for ensuring safe drinking water is shared by EPA, the states, and, most importantly, local water systems. In general, EPA sets standards to protect drinking water quality and to ensure the proper operation and maintenance of public water systems. EPA also oversees state implementation of the Safe Drinking Water Act and applicable regulations where states have assumed primary responsibility for enforcement. The states ensure that local water systems meet EPA and state requirements, provide technical assistance, and take enforcement action, as necessary. In addition, the states collect information on the results of drinking water monitoring, among other things, and report the information to EPA. At the local level, public water systems operate and maintain their facilities in accordance with federal and state requirements, periodically test the drinking water to ensure that it meets quality standards, install needed treatments, and report required information to the states.

In contrast to most drinking water contaminants, lead is rarely found in the source water used for public water supplies. Instead, lead enters tap water as a result of the corrosion that takes place over time when materials containing lead in the water distribution system or household plumbing come into contact with water. For example, lead can leach out of service lines, pipes, brass and bronze fixtures, solders, or other materials, and contaminate drinking water. To address this problem, EPA established requirements for corrosion control treatment, source water treatment, lead service line replacement, and public education. The lead rule requires water systems to test the tap water at a specified number of locations that are at high risk of lead contamination.<sup>4</sup> In general, if lead concentrations exceed 15 parts per billion in more than 10 percent of the samples, a water system has exceeded the action level and must (1) provide public education materials to its customers and (2) conduct additional testing to

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<sup>2</sup>Because this report examines only those requirements and activities applicable to lead, we will henceforth refer to this rule as the “lead rule.” See 40 C.F.R. § 141.80 *et. seq.*

<sup>3</sup>42 U.S.C. § 300f *et. seq.*

<sup>4</sup>Under the lead rule, high risk sites include single-family homes that contain copper pipes with lead solder installed after 1982 or lead pipes—or that are served by lead service lines.

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determine if treating lead contamination from the water's source may be necessary. Water systems that exceed the action level may also be required to install corrosion control treatment to reduce the water's corrosiveness. When treatment is not effective in controlling lead levels, a water system must annually replace at least 7 percent of any lead service lines it owns. To further address the problem of lead in household plumbing, the Congress amended the Safe Drinking Water Act in 1986 and 1996 to, among other things, ban the use of lead solder and plumbing materials that are not "lead-free."

In addition, under the Lead Contamination Control Act of 1988, the Congress required the recall of drinking water coolers with lead-lined tanks, banned the manufacture and sale of water coolers that were not lead-free, and required states to establish programs to assist local agencies in testing and correcting for lead in water supplies in schools and child care facilities.<sup>5</sup> While the Consumer Product Safety Commission was responsible for managing the recall, EPA was responsible for distributing a list of banned coolers and publishing and distributing guidance on detecting and remediating lead contamination in school drinking water supplies.

In March 2005, we issued a report that focused on the lead contamination problem in the District of Columbia's drinking water supplies.<sup>6</sup> For a national perspective on controlling lead in drinking water, you asked us to determine (1) the extent to which EPA has sufficient data to oversee implementation of the lead rule, (2) what implementation of the rule to date suggests about the need for changes to the regulatory framework, and (3) the extent to which drinking water supplies at schools and child care facilities are tested for lead and their users protected from elevated lead levels. For information on the data EPA uses for oversight of lead rule implementation, we analyzed EPA data on the results and frequency of lead testing, the status of corrective actions, and violations. We determined that the data on results and frequency of testing were sufficiently reliable to show compliance trends. However, we found that other data on corrective

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<sup>5</sup>Generally, schools and child care facilities that operate their own water systems are required to test their drinking water under EPA's lead rule. EPA estimates that there are approximately 10,000 such systems in the United States.

<sup>6</sup>GAO, *District of Columbia's Drinking Water: Agencies Have Improved Coordination, but Key Challenges Remain in Protecting the Public from Elevated Lead Levels*, GAO-05-344 (Washington, D.C.: Mar. 31, 2005).

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actions and violations were not sufficiently reliable to assess the status of efforts to implement and enforce the lead rule. For information on experiences in implementing the lead rule and the need for changes to the regulatory framework, we analyzed the responses to a 2004 EPA information request on states' implementation policies and practices, the results of EPA-sponsored expert workshops, and relevant documents. We also obtained test results from NSF International on lead content and lead leaching of plumbing fittings and fixtures. To assess data reliability, we obtained information on NSF International's procedures for data quality control and determined that the data were sufficiently reliable for illustrative purposes. For information on efforts to control lead in drinking water at schools and child care facilities, we analyzed the results of a 2004 50-state information request by EPA, an EPA workshop that focused specifically on schools and child care facilities, and relevant documents.

We supplemented the information collected under each objective by contacting state and local drinking water officials in 10 states. We selected eight of the states—California, Illinois, Iowa, Massachusetts, Michigan, New York, Pennsylvania, and Washington—because they either had a relatively high number of water systems with test results that exceeded or fell just below the lead action level, or they added to the geographical diversity of our selections. We also obtained information from Connecticut and Florida, two states that EPA identified as particularly active in addressing potential lead contamination in water supplies serving child care facilities. In all 10 states, we obtained information from state drinking water program managers, state public health or education officials, and local school districts that have efforts under way to test for and remediate lead contamination. (App. I contains a detailed description of our scope and methodology.) We performed our work between June 2004 and November 2005 in accordance with generally accepted government auditing standards.

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## Results in Brief

While EPA's data suggest that the number of drinking water systems with elevated lead levels has declined significantly since the early 1990s, the agency does not have a complete picture of how states and water systems are implementing the lead rule because data on key aspects of water systems' compliance with regulatory requirements are incomplete or questionable. According to EPA's data, the number of systems exceeding the lead action level dropped by nearly 75 percent from the initial monitoring conducted during 1992 to 1994—shortly after the lead rule took effect—and the period from 2002 to June 2005. However, our analysis

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disclosed that EPA's database does not contain recent test results on over 30 percent of the community water systems, apparently because states have not met reporting requirements. EPA's data on the status of water systems' efforts to implement the lead rule are similarly incomplete. The agency requires the states to report certain "milestones" to indicate whether a water system's lead levels are acceptable or whether the system is implementing required corrective actions, such as installing corrosion control treatment and replacing lead service lines. Through June 2005, however, EPA's database did not contain any milestone information on more than 70 percent of the nation's community water systems. Finally, because some states reported few or no violations of lead rule testing and treatment requirements over multiple years, the completeness of these data is questionable. EPA has been slow to take action on these data problems and, as a result, lacks the information it needs to evaluate how effectively the lead rule is being implemented and enforced nationwide.

The experiences of EPA, states, and water systems in implementing the lead rule have revealed weaknesses in the regulatory framework, including both oversight and the regulations themselves, which may be undermining the intended level of public health protection. Consequently, some changes to the regulatory framework are necessary. First, the sites used for lead testing may no longer represent the sites with the highest risk of contamination. For example, when the sampling locations approved initially are no longer available or appropriate, water systems identify new sites and states may not be tracking the changes to ensure that new sites meet high risk criteria. Another concern is that most states do not require their water systems to notify the homeowners who volunteer for periodic lead monitoring of the test results and do not know the extent to which such notifications are actually occurring. In addition, the effectiveness of corrosion control can be impaired by changes to other treatment processes and, in some states, testing and other controls that would help avoid such impacts may not be adequate. Finally, existing standards for plumbing fixtures and devices may not be protective enough, according to some experts, because testing has determined that some of the products defined as "lead-free" under the Safe Drinking Water Act can still contribute high levels of lead to drinking water. To improve implementation of the lead rule, EPA is considering a number of changes to its regulations, such as requiring advance notice of treatment modifications that could affect corrosion control. EPA is also considering changes to its guidance to improve and clarify specific aspects of the lead rule.

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Although data are limited, it appears that few schools and child care facilities have tested their water supplies for lead—or adopted other measures to protect users from lead contamination—either in response to the Lead Contamination Control Act of 1988 or as part of their current operating practices. Little data are available to assess (1) the scope and effectiveness of the effort to recall water coolers or (2) the extent and results of any testing. In addition, although the act required states to establish programs to assist local agencies in addressing potential lead contamination at schools and child care facilities, this provision was declared unconstitutional in 1996 and state efforts were generally limited. Current efforts to detect and remediate lead in drinking water at schools and child care facilities appear limited, based on the results of EPA's 50-state information request and our discussions with 10 states. In recent years, some of these facilities have tested voluntarily, and school districts in some cities such as Boston, Philadelphia, and Seattle, have detected elevated lead levels at some drinking water outlets. However, little information exists on the pervasiveness of the problem nationwide because no focal point exists at the national or state level to collect and analyze the test results or share information on effective remediation strategies. State and local officials say that dealing with other environmental problems in their facilities—including lead paint, asbestos, and mold—is a higher priority because more information is available on the nature and extent of these hazards.

We are making a series of recommendations to improve oversight and implementation of the lead rule. Among other things, we are recommending that EPA take steps to ensure that data on key aspects of lead rule implementation are timely and complete so that the agency is better able to assess the effectiveness of the rule and state oversight and enforcement efforts. Other recommendations focus on strengthening aspects of the regulatory framework, such as lead monitoring requirements, review of treatment changes that could affect corrosion control, and standards for plumbing fittings and fixtures. Finally, we are recommending that EPA collect and analyze existing data to assess the extent of lead contamination in drinking water at schools and child care facilities and appropriate remedial actions. In commenting on a draft of this report, EPA generally agreed with our findings and recommendations. In particular, EPA acknowledged that it needs better data to assess the effectiveness of lead rule implementation and enforcement. In addition, EPA agreed that the aspects of the regulation that we identified as needing improvement warrant additional attention and noted its plans to address most of these areas by modifying the rule or collecting additional



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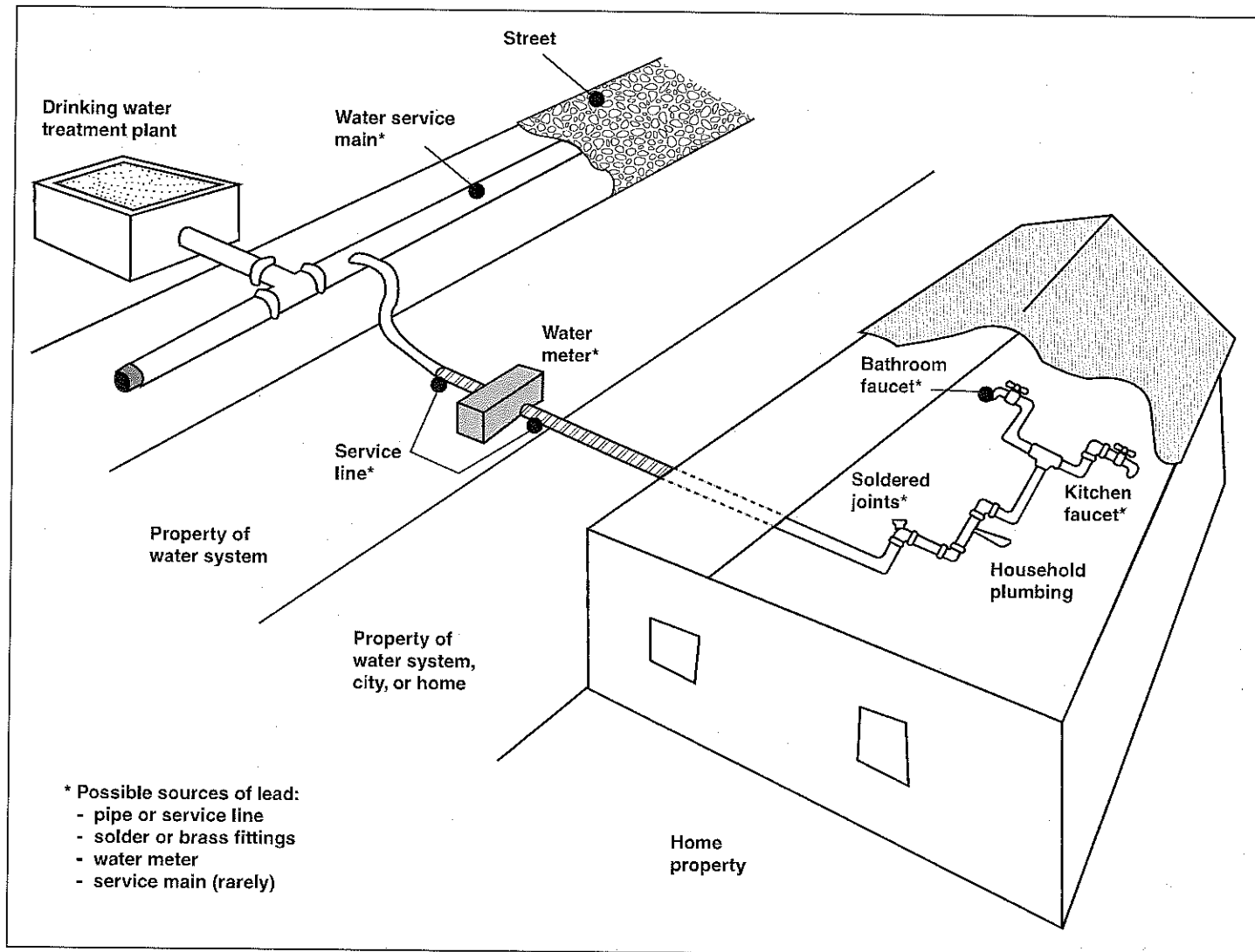
information. EPA did not address our recommendations regarding lead contamination and remedial actions at schools and child care facilities.

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## Background

Under the Safe Drinking Water Act, EPA is responsible for regulating contaminants that may pose a public health risk and that are likely to be present in public water supplies. EPA may establish an enforceable standard—called a maximum contaminant level—that limits the amount of a contaminant that may be present in drinking water. However, if it is not economically or technically feasible to ascertain the level of a contaminant, EPA may instead establish a treatment technique to prevent known or anticipated health effects. In the case of lead, EPA established a treatment technique—including corrosion control treatment—because the agency believed that the variability of lead levels measured at the tap, even after treatment, makes it technologically infeasible to establish an enforceable standard. EPA noted that lead in drinking water occurs primarily as a byproduct of the corrosion of materials in the water distribution system or household plumbing, some of which is outside the control of the water systems. Figure 1 illustrates the distribution system for drinking water and potential sources of lead contamination.

Figure 1: Water Distribution System from the Treatment Plant to Household Plumbing



Source: EPA.

EPA's lead rule also established a 15-parts-per-billion lead action level, which is based on the 90<sup>th</sup> percentile level of water samples taken at the tap. Water systems must sample tap water at locations that are at high risk of lead contamination, generally because they are served by lead service lines or are likely to contain lead solder in the household plumbing. The number of samples that must be collected varies depending on the size of

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the water system and the results of earlier testing. Small or medium-sized systems whose test results are consistently below the action level may be allowed to reduce the frequency of monitoring and the number of samples collected.<sup>7</sup>

To determine their test results at the 90<sup>th</sup> percentile level, water systems must multiply the number of samples taken during a monitoring period by 0.9 and identify the result at that level, after ranking the results of the individual samples they collected in ascending order. For example, a water system required to take 50 samples would rank the results from 1 (for the lowest result) to 50 (for the highest result); the 90<sup>th</sup> percentile level is the 45<sup>th</sup> result, 5 below the highest test result for that monitoring period. When the 90<sup>th</sup> percentile results for a water system are above 15 parts per billion, the system has exceeded the lead action level and must meet requirements for public education and source water treatment. Under the public education requirements, water systems must inform the public about the health effects and sources of lead contamination, along with ways to reduce exposure. Source water responsibilities include, at a minimum, water monitoring to determine if the lead contamination is from the water source rather than—or in addition to—service lines or plumbing fixtures.<sup>8</sup>

Water systems that exceed the action level may also be required to install corrosion control treatment, except for large systems that may qualify as having optimized corrosion control based on other criteria.<sup>9</sup> When either corrosion control or source water treatment are not effective in controlling lead levels, the lead rule calls for water systems with lead service lines to begin replacing them at a rate of 7 percent annually (unless the state requires a higher rate).

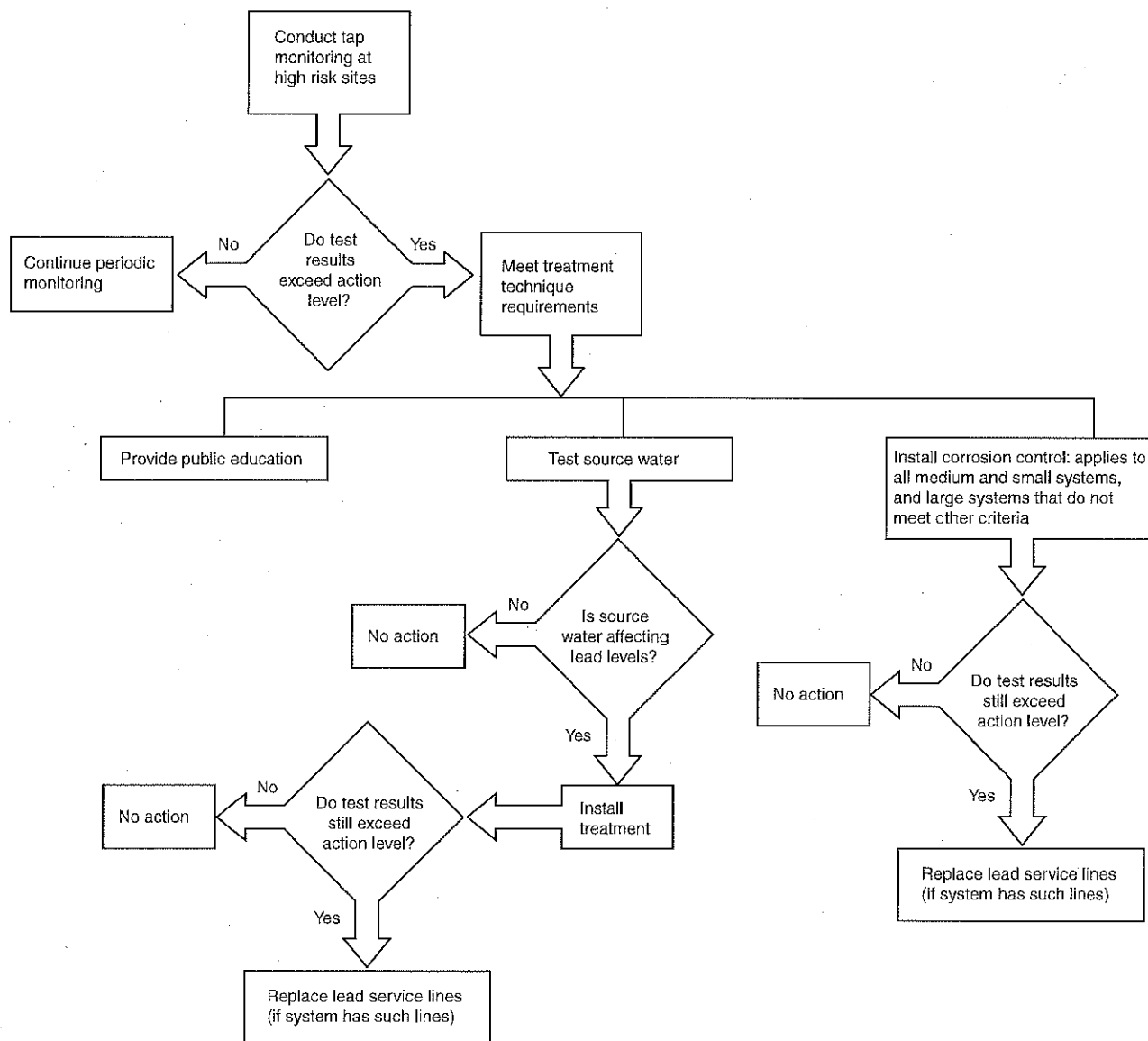
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<sup>7</sup>In addition, all systems that have installed corrosion control treatment and consistently meet water quality control parameters specified by the state may also qualify for reduced monitoring.

<sup>8</sup>If testing indicates that the source water is contributing to elevated lead levels, then water systems may be required to install additional treatment.

<sup>9</sup>Large water systems exceeding the action level must install corrosion control treatment unless (1) they already had such treatment in place prior to the effective date of the lead rule and have conducted related activities equivalent to those specified in the lead rule or (2) they can demonstrate that their source water is minimally corrosive, thereby reducing the likelihood that lead will be introduced into the drinking water from corrosion of lead-bearing plumbing materials.

**Figure 2: Process Drinking Water Systems Follow to Comply with EPA's Lead Rule**



Source: GAO.

The states play an important role in ensuring that the lead rule is implemented and enforced at the local level. Among other things, they are responsible for (1) ensuring that water systems conduct required monitoring and (2) reporting the results to EPA. If the systems must take

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corrective action to address elevated lead levels, the states are responsible for approving or determining the nature of the treatment or other activities that will be required, ensuring that they are implemented, and periodically reporting relevant information to EPA. The Safe Drinking Water Act authorizes the states to assume primary responsibility for enforcing the drinking water program—including the lead rule—if they meet certain requirements, such as adopting drinking water regulations at least as stringent as EPA's and having adequate procedures to carry out and enforce the program's requirements. All states except Wyoming have assumed primacy for managing their drinking water programs.

In addition to requiring the regulation of lead in public water supplies, the Safe Drinking Water Act also contains provisions to limit the extent to which materials in the water distribution system and household plumbing contribute to lead levels at the tap. Specifically, the act banned the use of solder and other materials in the installation or repair of public water systems or plumbing that are not lead-free. In this regard, the act established a material standard by defining "lead-free" to mean solders and flux containing no more than 0.2 percent lead, and pipes and pipe fittings containing no more than 8.0 percent lead.<sup>10</sup> In addition, the act called for development of voluntary performance standards and testing protocols for the leaching of lead from new plumbing fittings and fixtures by a qualified third party certifier or, if necessary, promulgated by EPA. A third party certifier set such a standard in 1997, limiting the amount of lead that the fittings and fixtures may contribute to water to 11 parts per billion.

To address the potential risks of lead contamination in water supplies serving schools and child care facilities, Congress passed the Lead Contamination Control Act of 1988.<sup>11</sup> Among other things, the act banned the manufacture and sale of drinking water coolers containing lead-lined tanks and other water coolers that are not lead-free and required (1) EPA to publish a list of such coolers and distribute it to the states, (2) the Consumer Product Safety Commission to issue an order requiring manufacturers and importers to repair or replace lead-lined coolers or recall and provide a refund for them, and (3) the states to establish programs to assist local agencies in addressing potential lead

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<sup>10</sup>42 U.S.C. § 300g-6(d).

<sup>11</sup>42 U.S.C. § 300j-21 *et seq.*

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contamination.<sup>12</sup> In 1990, EPA identified six models of water coolers from one manufacturer that contained lead-lined tanks, but the agency was unable to obtain information on the number of units produced. Regarding water coolers that were not lead-free, EPA identified three manufacturers that produced coolers containing lead solder that could contaminate drinking water. The manufacturers reported producing at least 1 million of the coolers.

Following the discovery of elevated lead levels in the District of Columbia's drinking water, EPA undertook a year-long evaluation to gain insight into how states and local communities are implementing the lead rule and to determine whether the problems identified in the District of Columbia are occurring elsewhere. EPA's activities included

- a series of expert workshops on key aspects of the rule (monitoring protocols, simultaneous compliance, lead service line replacement, public education, and lead in plumbing fittings and fixtures),
- a review of state policies and practices for implementing the lead rule,
- data verification audits that covered the collection and reporting of compliance data for the lead rule in 10 states, and
- an expert workshop and a review of state efforts to monitor for lead in drinking water at schools and child care facilities.

Participants in EPA's expert workshops included representatives of federal and state regulatory agencies, drinking water systems, researchers, public interest groups, and others.

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<sup>12</sup>Coolers are considered "lead-free" if any parts or components that may come in contact with drinking water have no more than 8 percent lead or include solder, flux, or interior surfaces with no more than 0.2 percent lead. 42 U.S.C. § 300j-21(2).

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## Inadequate Data Impair EPA's Ability to Oversee Implementation of the Lead Rule

Although EPA's data on the results of testing indicate that the lead rule has largely been successful in reducing lead levels, the reporting of these data has not been timely or complete. In addition, key data on the status of water systems' efforts to implement the lead rule, including required corrective actions, are incomplete. EPA's data on lead rule violations are also questionable because of potential underreporting by the states. The lack of data on key elements of lead rule implementation makes it difficult for EPA and others to gauge the effectiveness of efforts to meet and enforce the rule's requirements.

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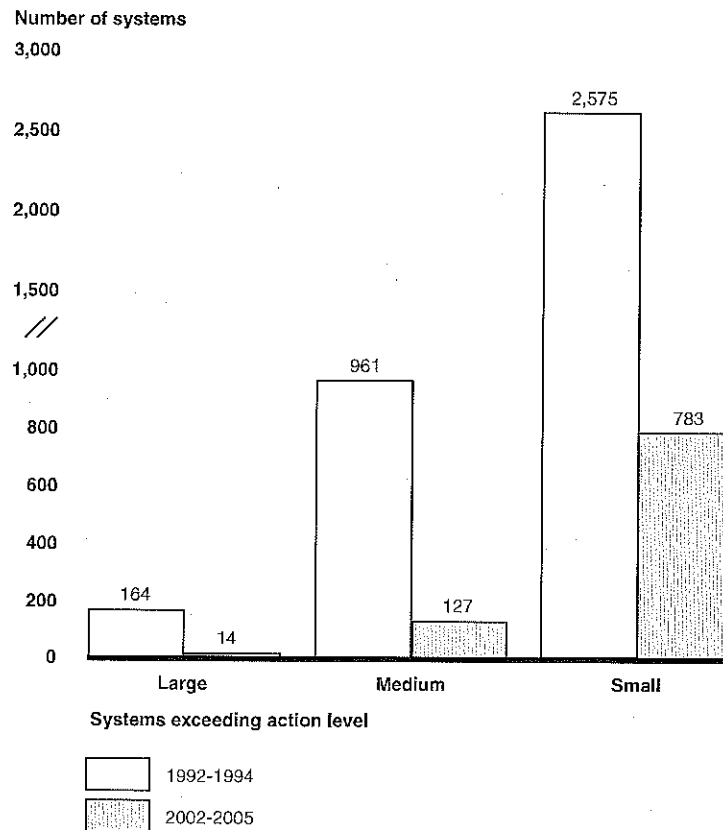
## Although EPA's Data Suggest a Decline in Lead Levels, States' Reporting on the Results of Lead Testing Has Not Been Timely or Complete

When the lead rule was first implemented, initial monitoring disclosed that several thousand water systems had elevated lead levels—that is, more than 10 percent of the samples taken at these systems exceeded the 15-parts-per-billion action level. EPA's most recent data indicate that the number of water systems that exceed the lead action level has declined by nearly 75 percent since the early 1990s. The systems that currently have a problem with elevated lead levels represent about 2 percent of all water systems and serve approximately 4.6 million people. Figure 3 shows the results (by system size) of the initial lead monitoring, conducted from 1992 to 1994, and more recent testing from 2002 through the quarter ending in June 2005.<sup>13</sup>

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<sup>13</sup>EPA provided us with a data run as of August 9, 2005. According to EPA, these data represent, for the most part, compliance information reported through June 30, 2005; however, states may have made a limited number of additions or corrections to the data through the run date.

**Figure 3: Number of Community Water Systems That Exceeded the Lead Action Level During the Initial Monitoring Period (1992-1994) and Their Most Recently Completed Monitoring (2002-June 2005), by System Size**



Source: EPA.

Notes: (1) Figure 3 includes data on active community water systems in the 50 states and the District of Columbia. The size categories for the water systems are based on population served, with large systems serving populations of greater than 50,000, medium systems from 3,301 to 50,000, and small systems less than or equal to 3,300.

(2) Data for initial monitoring under the lead rule cover the period from 1992 to 1994 because the testing was phased in by system size. Large water systems began monitoring in January 1992, medium systems in July 1992, and small systems in July 1993.

(3) Many water systems have obtained approval to reduce the frequency with which they are required to monitor for lead from every 6 months to once a year or once every 3 years. Thus, to capture the most recent round of testing for all water systems, we included data from 2002 through June 2005, the most recent data available at the time of our analysis. A few small systems have received approval to reduce their monitoring to once every 9 years and may not be included in these statistics.

(4) Some water systems may have tested their lead levels multiple times during the periods covered in this analysis; however, we included only the results of the initial monitoring and the most recent test result for each system.



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(5) We determined that the data are sufficiently reliable for the purposes of examining trends in lead action levels.

EPA, state, and water industry officials generally see the decline in the number of systems with elevated lead levels as evidence that the lead rule has been effective and point to corrosion control treatment as the primary reason. Another indicator of success is the number of water systems approved for reduced monitoring. Under the lead rule, water systems can obtain state approval to reduce both the frequency of monitoring and the number of samples included in the testing when test results show lead levels consistently below the action level. According to EPA's data, nearly 90 percent of all water systems have qualified for reduced monitoring.

After several years of experience with the lead rule, in January 2000, EPA made significant changes to the information states were required to report for inclusion in the agency's database. Among other things, EPA added a requirement for states to report, for large and medium-sized systems, all 90<sup>th</sup> percentile test results, not just the results for systems that exceed the action level. EPA said that it planned to use these test results to show how levels of lead at the tap have changed over time for large and medium systems and, by extrapolation, for small systems.

Although the new reporting requirements took effect in January 2002, EPA's database contained 90<sup>th</sup> percentile test results for only 23 percent of the large and medium systems by January 2004.<sup>14</sup> EPA officials explained that states were still having difficulty updating their information systems to accommodate the new reporting requirements and, for EPA, obtaining the data was not a priority at that time. Following the detection of elevated lead levels in the District of Columbia, however, EPA made a concerted effort to obtain more complete information from the states, and, as of June 2004, EPA reported that it had data for nearly 89 percent of the large and medium systems (based on an analysis of test results submitted from January 2000 through May 2004). However, we also analyzed data on the results of lead testing and found that EPA's database does not contain current information for a much larger percentage of large and medium water systems. Specifically, we found that for the period from January 2002

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<sup>14</sup>EPA issued minor revisions to the lead rule, including changes to the reporting requirements, in January 2000. While the revisions generally took effect as of April 2000, one exception was the reporting requirements. Although states were encouraged to begin meeting the new requirements sooner, they did not officially take effect until January 2002. See 65 Fed. Reg. 1991 (Jan. 12, 2000).

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through June 2005, EPA's database lacks any test results for nearly 31 percent of the large and medium water systems.<sup>15</sup> We could not determine whether the data are missing because states have not reported the results or because testing has not occurred. When asked whether states have been updating test results in a timely manner since 2004, an official representing EPA said that the timeliness of recent test data is unknown; the agency has not been tracking whether states are adequately maintaining data on the results of lead testing.

Regarding the information required for small water systems—which is limited to test results exceeding the action level—officials from both the Office of Ground Water and Drinking Water and the Office of Enforcement and Compliance Assurance indicated that some data are probably missing but could not provide specific estimates. An official from the Office of Ground Water and Drinking Water commented that EPA's database likely includes most of the required small system data because action level exceedances trigger follow-up activities and states are more likely to pay attention to those cases.

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### EPA Does Not Have Complete Information on the Status of Water Systems' Efforts to Implement Lead Rule

As part of EPA's efforts to improve its indicators of lead rule implementation, the agency restructured its reporting requirements and reduced the number of "milestones" that states are required to report from 11 to 3. EPA established three corrective action milestones, including (1) a DEEM milestone, meaning that the system is deemed to have optimized corrosion control; (2) an LSLR milestone, meaning that the system is required to begin replacing its lead service lines; and (3) a DONE milestone, meaning that the system has completed all applicable requirements for corrosion control, source water treatment, and lead service line replacement.<sup>16</sup>

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<sup>15</sup>Our analysis included active community water systems. Of the water systems lacking data, 157 are large and 2,457 are medium-sized systems.

<sup>16</sup>For the purposes of this report, we are using the term "corrective action milestones" although, in some instances, water systems can be reported as meeting a milestone without taking or completing a corrective action. For example, water systems do not necessarily have to install treatment to be deemed to have optimized corrosion control. They may be eligible for a DEEM designation because their lead levels are consistently low or they can demonstrate that they have minimally corrosive water.

EPA officials told us that the vast majority of water systems should have at least one milestone in the database. They indicated that in most instances, systems should have a DEEM designation because they have installed corrosion control or qualify for meeting the milestone otherwise. However, we found that, overall, EPA has information on corrective action milestones for only 28 percent of the community water systems nationwide—and lacks any milestone data on the remaining 72 percent. Table 1 summarizes the results of our analysis.

**Table 1: Corrective Action Milestone Data Reported by the States through June 2005, by System Size and Type of Milestone<sup>a</sup>**

System size	Number of water systems	Systems without any milestone data		Systems with milestones			Total systems with one or more milestones <sup>c</sup>	
		Number	Percent	DEEM <sup>b</sup>	LSLR	DONE	Number	Percent
Large	841	600	71.3	202	7	206	241	28.7
Medium	7,620	5,335	70.0	2,122	15	1,850	2,285	30.0
Small	42,991	31,195	72.6	11,254	21	8,838	11,796	27.4
<b>Total</b>	<b>51,452</b>	<b>37,130</b>	<b>72.2</b>	<b>13,578</b>	<b>43</b>	<b>10,894</b>	<b>14,322</b>	<b>27.8</b>

Source: GAO analysis of EPA data.

<sup>a</sup>This table reflects the milestone data that states reported for active community water systems.

<sup>b</sup>In the case of the DEEM milestone, states are required to report the basis for their determinations that systems have optimized corrosion control and EPA established three reason codes for that purpose. We found that EPA's database contained the required reason codes for 100 percent of the 13,578 systems with a DEEM milestone.

<sup>c</sup>Because individual water systems may have multiple milestones in EPA's database, this column represents the number of unique systems with one or more milestones to avoid "double counting."

The extent to which milestone data were reported to EPA varied from state to state. We found that 22 states had not reported milestones for any of their water systems and another 8 states had reported data on about 10 percent of their systems. (See app. II for a state-by-state breakdown of reported milestone data.)

EPA officials believe that most water systems have actually taken the steps necessary to meet the criteria for the DEEM milestone, at a minimum, and attribute the lack of milestone data to non-reporting by the states rather than noncompliance by the water systems. They also suggested that some of the 22 states we identified as having reported no milestone data, based on our analysis of EPA's current data, may have reported corrective actions

prior to 2000, when EPA modified the number and type of milestones. However, we reviewed archived data in EPA's database and found that 8 of the 22 states had also not reported any milestones prior to 2000, and another 11 states had reported data on no more than 10 percent of their systems. Overall, the 50 states had reported milestone data for only 5.7 percent of their community water systems prior to 2000.

Moreover, some information in EPA's database is inconsistent with other reported data. Specifically, we found differences between the information on lead service line replacement in EPA's database—systems having an LSLR milestone—and the information states reported in the agency's 50-state review of lead rule implementation policies and practices. As table 2 shows, seven states reported requiring lead service line replacement in response to EPA's June 2004 query but did not have any LSLR milestones in EPA's database in the same time frame.

**Table 2: Differences in Reported Information on Lead Service Line Replacement, as of June 2004**

States reporting required lead service line replacement activity in EPA's June 2004 information request <sup>a</sup>	States reporting LSLR milestone in EPA's database as of June 2004 <sup>b</sup>
Arizona	
Connecticut	
Illinois	Illinois
Iowa	
Massachusetts	Massachusetts
Michigan	
Minnesota	Minnesota
Montana	Montana
New York	
Pennsylvania	Pennsylvania
Utah	
Wisconsin	
	Virginia
12 states	6 states

Source: GAO analysis of EPA data.

<sup>a</sup>In response to EPA's information request, 11 states reported that some water systems were voluntarily replacing lead service lines—or, in two instances, the "goosenecks" connecting the water main to a service line. The 11 states included one state (Michigan) that also reported requiring one or more systems to replace lead service lines.

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<sup>b</sup>The District of Columbia was also identified in EPA's database with an LSLR milestone.

In addition, after following up with state officials, we found that EPA's database did not contain accurate data on the number of water systems required to replace lead service lines because the states were not providing timely updates or correcting erroneous information.

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### Data on Lead Rule Violations Are Questionable Because of Potential Underreporting by the States

Periodic audits by EPA—and our own analyses—raise questions about the completeness of EPA's data on lead rule violations. To assess the reliability of its drinking water data, EPA regularly conducts data verification audits that evaluate state compliance decisions and the adequacy of states' reporting to the national database. In addition, EPA prepares a national summary evaluation of the reliability of drinking water data every 3 years. While past data verification audits have not assessed compliance decisions under the lead rule, to the extent that states' reporting practices are relatively consistent across regulations, the audits may shed some light on the types of problems likely to be found in the reporting of lead rule data. According to the most recent national summary of data reliability,<sup>17</sup> which covered audits conducted from 1999 to 2001, the estimated error rate for health-based violations—involving maximum contaminant level or treatment technique requirements—was 35 percent, down from 60 percent in the prior national report, which covered audits conducted from 1996 to 1998. For monitoring and reporting violations, the estimated error rate was 77 percent, down from 91 percent in the prior report. The March 2004 report said that most violation errors resulted from incorrect compliance determinations by the states, meaning that the state should have cited a violation but did not. Other problems included “data flow” errors (when the state correctly identified a violation but did not report it to EPA) and errors in EPA's database (such as violations that were incorrectly reported or not removed when rescinded).

Another analysis from EPA's March 2004 report did include the lead rule and the results also raise questions about the completeness of EPA's data on lead rule violations. The report states that by means of a tool that tracks the number of violations reported in each state over a period of several

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<sup>17</sup>EPA, *Drinking Water Data Reliability Analysis and Action Plan (2003)*, EPA 816-R-03-021 (Washington, D.C., March 2004). The report's estimates of data quality have an 80 percent confidence level and a 7.5 percent margin of error.

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years, EPA determined that 14 states had not reported any treatment technique violations under the lead rule during a 6-year period from 1997 to

2002.<sup>18</sup> The report noted that this potential non-reporting should be evaluated further and recommended that EPA and the states conduct annual evaluations of all instances of potential non-reporting. EPA's Office of Ground Water and Drinking Water asked the regional offices to follow up with the states regarding the potential underreporting, as recommended in the March 2004 report on data reliability. For the most part, however, the regions' responses did not address the lack of treatment technique violations under the lead rule in the applicable states; two of the regional offices did not provide written responses. Officials from EPA's Office of Enforcement and Compliance Assurance were not aware of the violations analysis. The officials told us that because of limited resources, they focus their efforts on helping to ensure that states address the worst compliance problems—water systems identified as significant noncompliers as a result of the frequency or severity of their violations.

A lack of violations—or a relatively low number of water systems with violations—does not necessarily mean that states are not meeting reporting requirements, or that their compliance monitoring and enforcement efforts are inadequate. However, analyzing the violations data and following up on the results could provide some useful insights into the reasons for differences among the states; it could also help identify problem areas and best practices. We updated EPA's analysis of violations and, as table 3 shows, the percentage of water systems that have had one or more violations over the past 10 years varies from state to state, particularly in the case of monitoring violations.

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<sup>18</sup>EPA includes several types of violations in its treatment technique category, including failure to install optimal corrosion control treatment, failure to meet water quality control parameters, failure to replace lead service lines, and failure to meet public education requirements, among other things.

Table 3: Percentage of Systems with Violations from 1995 to June 2005<sup>a</sup>

Monitoring violations		Treatment technique violations	
Percent of systems with violations <sup>b</sup>	Number of states	Percent of systems with violations <sup>b</sup>	Number of states
0	1	0	11
> 0 to 5	10	> 0 to 1	16
> 5 to 10	6	> 1 to 5	14
> 10 to 20	11	> 5 to 10	6
> 20 to 30	9	> 10	3
> 30 to 40	7		
> 40	6		
<b>Total</b>	<b>50</b>	<b>Total</b>	<b>50</b>

Source: GAO analysis of EPA data.

<sup>a</sup>We used 1995 as the starting point for our analysis because all water systems should have completed their initial monitoring by the end of 1994.

<sup>b</sup>Some water systems in EPA's database have multiple violations. To avoid double counting, we identified the percent of unique systems with one or more violations.

Appendix III contains a state-by-state analysis of lead rule violations reported from 1995 to June 2005.

More recently, EPA conducted data verification audits during the fall of 2004, which focused exclusively on states' compliance determinations under the lead rule in five states and included the lead rule as part of the audit in another five states. However, the results are not yet available. EPA officials have been analyzing the data and obtaining comments on the preliminary findings from the states; they expect to issue a final report by the end of calendar year 2005.

## Lack of Data Affects EPA's Ability to Evaluate the Effectiveness of Lead Rule Implementation and Enforcement

In changing its reporting requirements in January 2000, EPA recognized that it needed better indicators of the lead rule's implementation. Regarding the 90<sup>th</sup> percentile results of lead monitoring, EPA noted that in terms of routine reporting, these data are the only measure it has for showing the lead rule's effectiveness and said that, without such data, the agency would have no way to measure progress.<sup>19</sup> Similarly, EPA

<sup>19</sup>65 Fed. Reg. 1991 (Jan. 12, 2000).

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maintained that having information on water systems' corrective action milestones, along with quarterly violation and follow-up information, would provide data on the status of lead rule implementation and allow the targeting of compliance and enforcement activities.<sup>20</sup> Given the reduced number of milestones, EPA indicated that it would be critical for states to report the information completely and in a timely manner, and that the agency would be following up with the states to ensure that such reporting was occurring.

Despite the importance of the 90<sup>th</sup> percentile results and corrective action milestones to evaluating the lead rule's implementation, our analyses confirmed or identified significant and longstanding gaps in the amount of information available. Although EPA attempted to ensure that it had complete data on the results of lead testing, following the publicity surrounding the incidence of lead contamination in the District of Columbia, the problems with incomplete test result data have continued and the agency has not followed up on the missing milestone data. EPA has also been slow to take action on the potential underreporting of violations. As noted earlier, following its March 2004 report on data reliability, EPA did not determine the reasons for the lack of violations reported by some states. EPA's previous summary evaluation, which was issued in October 2000, identified similar indications of underreporting and called for targeted attention to the applicable states and regions to address the issues and develop action plans.<sup>21</sup>

EPA needs complete, accurate, and timely data to monitor water systems' progress in implementing the lead rule, identify potential problem areas and best practices, and take appropriate action. In particular, not having complete or reliable data on corrective action milestones or violations makes it difficult to assess the adequacy of EPA and state enforcement efforts. However, officials from EPA's Office of Enforcement and Compliance Assurance told us that the amount of enforcement resources devoted to the drinking water program—including enforcement of the lead rule—has declined in recent years. They also told us that while they hold monthly meetings with their counterparts in EPA's regional offices and

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<sup>20</sup>63 Fed. Reg. 20043 (Apr. 22, 1998).

<sup>21</sup>EPA, *Data Reliability Analysis of the EPA Safe Drinking Water Information System/Federal Version (SDWIS/FED)*, EPA 816-R-00-020 (Washington, D.C.: Oct. 2000). EPA found that from 1993 to 1998, 1 state had not reported any lead monitoring violations and 21 states had not reported any treatment technique violations related to the lead rule.



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state officials to discuss the more significant violators, the officials have not systematically evaluated state enforcement efforts with regard to the lead rule. See appendix IV for information on EPA and state enforcement actions, by type, from 1995 to June 2005.

EPA and state officials attribute the problems with lead rule data to the complicated nature of the rule, the incompatibility of EPA and state information management systems, and resource constraints. For example, EPA officials noted that it is difficult to ensure that the database contains complete information—and includes data on every system that is required to test for lead in a particular period—because the frequency of required testing can vary depending on whether a system has qualified for reduced monitoring (and maintains that status in future periods). The same circumstances also make it difficult to develop trend data. EPA and state officials indicated that the January 2000 minor revisions to the lead rule, which made significant changes in states' reporting requirements, exacerbated existing problems with the transfer of accurate and timely data from the states to EPA. For that and other reasons, modifying the states' data systems to incorporate the new reporting milestones has been delayed. In addition to problems with the structure of the information systems—and technical problems in actually transferring data from the states to EPA—EPA and state officials acknowledge that reporting water systems' milestone data has been a low priority. The officials explained that since January 2004, states have been focusing their limited resources on reporting the 90<sup>th</sup> percentile test results for large and medium water systems.

EPA and the Association of State Drinking Water Administrators have been working on a Safe Drinking Water Information System modernization effort that should address at least some of current data problems, according to EPA officials. Among other things, the modernization will make it easier to transfer data between states and EPA so EPA's data will be more timely. To improve the accuracy of the data, EPA's system will have a component designed to validate state data before it is entered into the federal database. As of October 2005, EPA had completed the transition to its modernized system for the entry of new data.

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## Weaknesses in the Regulatory Framework for the Lead Rule May Undermine Public Health Protection

Based on their experiences in implementing the lead rule, EPA, state, and water system officials have identified six aspects of the rule for which oversight could be improved or the requirements modified to increase public health protection. Specifically, their experiences indicate that (1) the sampling sites used for lead testing may no longer reflect areas of highest risk, (2) reduced monitoring may not be appropriate in some instances, (3) the homeowners who participate in tap monitoring may not be informed of the test results, (4) controls over when and how treatment changes are implemented may not be adequate, (5) data on the effectiveness of lead service line replacement programs are limited, and (6) states vary in how they apply the lead rule when water systems sell drinking water to other systems. In addition, some of the officials responsible for implementing the lead rule and other drinking water experts believe that existing standards for plumbing fixtures may be outdated. EPA is considering modifications to the lead rule that will address some of the problems we identified.

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### Sampling Sites May No Longer Reflect Areas of Highest Risk

Under the lead rule, water systems must select sampling sites that are considered to be at high risk for contamination. The rule defines Tier 1 sites as single-family structures served by lead service lines, and/or containing lead pipes (or copper pipes with lead solder installed after 1982).<sup>22</sup> According to participants in EPA's workshop on monitoring protocols and state officials we interviewed, one problem is that EPA has never updated its site selection criteria and at least one of the criteria is outdated. Specifically, enough time has elapsed so that lead solder in plumbing installed from 1983 to 1986 is no longer "fresh" (lead solder was banned in 1986). Experts believe that, by now, solder from that period has been coated by a naturally occurring film that prevents lead leaching. Moving the sampling sites to other Tier 1 locations—for example, homes served by lead service lines—could be problematic. In the preamble to the lead rule, issued in 1991, EPA cited a survey by the American Water Works Association which estimated that only about 20 percent of the nation's community water systems have lead service lines. Moreover, although the lead rule required water systems to do a "materials evaluation" to identify an adequate pool of high risk sampling sites, according to EPA the

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<sup>22</sup>If a water system does not have a sufficient number of Tier 1 sites in its sampling pool, the system may use Tier 2 sites, which are buildings (including multi-family residences) that meet the Tier 1 criteria. If necessary, the system may obtain samples from Tier 3 sites, which are single-family structures that contain copper pipes with lead solder installed before 1983.

evaluation did not assess pipe materials system-wide, and many systems do not have a complete inventory of their service lines.

A related problem is that sampling locations have likely changed over time as sites are no longer available or appropriate, and states may not have procedures in place to ensure that these locations continue to represent the highest risk sites.<sup>23</sup> In this regard, EPA requested information from the states on how they “ensure that site locations were correctly followed during system sampling rounds.” As table 4 shows, a significant number of states may not be tracking changes in water systems’ sampling locations.

**Table 4: State Activities to Ensure that Water Systems Are Taking Lead Samples at Appropriate Sites**

Activity	Number of states
State uses tracking mechanisms such as special forms or unique codes to control sampling sites	14
State reported a less rigorous or less defined means of oversight <sup>a</sup>	11
State requires notification when systems change sampling locations but does not otherwise track sampling	5
State does not review or track sampling <sup>b</sup>	8
State did not answer question or provided information that was nonresponsive	12

Source: GAO analysis of EPA’s information request on state implementation policies and practices.

<sup>a</sup>For example, some states reported comparing the actual sampling locations with the sampling plans, some said that they advise their systems to continue sampling at the locations used during the initial sampling rounds, and others reported “reviewing” each round of sampling but did not mention comparing the sites to the sampling plans.

<sup>b</sup>Two of these states (California and Vermont) reported that they lacked the resources to ensure that their water systems are taking samples at the correct locations.

Another uncertainty is whether systems that are on reduced monitoring—and have been allowed to reduce the number of samples they collect—are taking samples from locations that represent the highest risk sites based on

<sup>23</sup>For example, homeowners may drop out of the sampling program, homes may be torn down or become vacant, or homeowners may install water softeners or other treatment devices that reduce lead levels.

previous testing.<sup>24</sup> According to the lead rule, these water systems must take their samples from sites included in the pool of high risk sampling sites identified initially. Although the systems have some indication of which sites within the pool have historically tested at higher or lower lead levels, the rule is silent on how sites within the pool are to be selected for reduced monitoring, except that they must be “representative” of the sites required for standard monitoring. In addition, the rule provides that states may specify the sampling locations. EPA requested information from the states on what role they play in selecting the sites used for reduced monitoring. We analyzed the states’ responses and found that, in most instances, the states’ role is limited; table 5 summarizes the results of our analysis.

**Table 5: State Role in Selecting Sites for Reduced Monitoring**

Activity	Number of states
State requires that highest risk sites, based on previous test results, are selected	3
State policy ensures that some of the highest risk sites, based on previous test results, are selected <sup>a</sup>	9
State provides general guidance and may review the water systems’ selections <sup>b</sup>	19
State plays no role in selecting sites for reduced monitoring	12
State did not answer question or provided information that was nonresponsive	7
<b>Total</b>	<b>50</b>

Source: GAO analysis of EPA’s information request on state implementation policies and practices.

<sup>a</sup>Among other things, some states require systems to select every other sampling site after ranking the sites by result from prior testing or alternate sites in each round of sampling.

<sup>b</sup>For example, many of these states instruct their water systems to focus on Tier 1 sites first (if their sampling pool also contains Tier 2 or Tier 3 sites) or say that the sites must be representative of those in the pool or of the distribution system.

<sup>24</sup>Under the lead rule, systems that qualify for reducing the frequency of monitoring because of consistently good test results may also reduce the number of samples they test (and accordingly, the number of locations from which they collect samples). Except for the smallest systems, which serve populations of 100 or fewer (and are only required to take 5 samples), water systems can cut the number of samples they collect by half. This means, for example, that the largest systems, serving populations of over 100,000, can reduce the number of sampling locations from 100 to 50.

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## Reduced Monitoring May Not Be Appropriate in Some Instances

According to EPA's lead rule, small and medium-sized water systems whose test results are consistently at or below the action level may reduce the frequency of monitoring from once every 6 months to annually and, if acceptable results continue, to once every 3 years.<sup>25</sup> In addition, systems of any size that operate within water quality control parameters reflecting optimal corrosion control treatment, as specified by the state, may reduce the frequency of monitoring under the same schedule.<sup>26</sup> The rule also lays out conditions under which water systems must return to standard monitoring—for example, small and medium-sized systems that have exceeded the action level. In addition, states have the flexibility to require systems to resume standard monitoring if the state deems it to be appropriate.<sup>27</sup> We analyzed EPA's compliance data and found some instances that raise questions about the states' decisions to allow reduced monitoring. Specifically, we found that 49 large and medium water systems were exceeding the 15-parts-per-billion action level and appeared to be on reduced monitoring schedules.<sup>28</sup> In addition, our analysis indicates that 104 large and medium systems with lead levels of 13-15 parts per billion also appear to be on reduced monitoring schedules. Although this is allowable under EPA's regulations, according to some state officials, systems with lead levels just below the action level should be subject to closer scrutiny and, thus, may not be good candidates for reduced monitoring.

To determine how states exercised their discretion with regard to monitoring frequency, we reviewed their responses to EPA's information

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<sup>25</sup>Specifically, if the test results are at or below the action level in two consecutive 6-month monitoring periods, the systems may reduce the frequency of monitoring to once a year. Further, systems that test below the action level in three consecutive annual monitoring periods may be allowed to conduct testing only once every 3 years. Small systems may be eligible to reduce their monitoring frequency to once every 9 years if (1) they can demonstrate that their distribution system, service lines, and drinking water supply plumbing (including the plumbing conveying drinking water within all residences and other buildings connected to the system) is lead-free and (2) all applicable test results do not exceed 5 parts per billion at the 90<sup>th</sup> percentile.

<sup>26</sup>When systems install corrosion control treatment, states must evaluate tap and water quality parameter samples to determine whether the system has properly installed and operated the treatment.

<sup>27</sup>When systems submit new monitoring or treatment data, or when other relevant data become available, states are required to review and, where appropriate, revise their determinations.

<sup>28</sup>In analyzing these data, we compared the most recent test results reported during the 2002 to June 2005 time frame and data on water systems' current monitoring frequency.

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request, which asked the states to describe how they determine if reduced monitoring is appropriate. According to their responses, the states by and large adhere to the requirements of the lead rule and allow reduced monitoring whenever a water system's test results are at or below the action level in consecutive monitoring periods.<sup>29</sup> Specifically, 40 states reported that they follow the federal regulation, 6 states indicated that they may be using some additional criteria for their reduced monitoring determinations,<sup>30</sup> and 4 states did not answer or provided information that was nonresponsive. EPA did not ask for the states' views on whether reduced monitoring is appropriate when a water system's test results are at or just below the action level or on circumstances in which states might determine that previously approved reduced monitoring is no longer appropriate—and the states did not volunteer such information. None of the states reported using other criteria, such as test results that are at or just below the action level, to delay or rescind approval for reduced monitoring.

A key issue is whether water systems should be required to resume standard monitoring following a major treatment change so that the potential effects of the change can be evaluated. Given the circumstances in which lead contamination became a problem in the District of Columbia, when a change in the system's disinfection treatment impaired the effectiveness of corrosion control, such decisions can be critical. In its information request on state implementation policies and practices, EPA asked the states whether they had ever required a system to conduct more frequent monitoring to evaluate the potential effects of a treatment change. It would have been useful to know more about the states' policies and practices in this regard, including how often the states required additional monitoring and the criteria they used in making such determinations.

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<sup>29</sup> Although the lead rule states that test results must "meet" the action level (i.e., be at or below the action level) for a water system to be eligible for reduced monitoring, 10 states reported that reduced monitoring is allowed only when the test results are "below" the action level. We did not follow up with these states to determine whether they actually differ from the federal rule or their response was in error.

<sup>30</sup> In some of these instances, the states' responses implied—but did not specify—additional criteria. Otherwise, two states (Louisiana and South Dakota) reported that water systems would be approved for triennial monitoring if their 90<sup>th</sup> percentile test results were less than half of the action level. Michigan limits reductions in the number of sampling locations in the case of "combined distribution systems," in which systems that purchase water are interconnected with a water wholesaler.

However, EPA's question was limited in scope and, as table 6 shows, the states often did not elaborate.

**Table 6: States That Require More Frequent Monitoring to Evaluate the Effects of Treatment Changes**

State policy	Number of states
States answered yes without elaborating on the frequency of—or criteria for—such decisions	11
States answered yes and included some indication of how often they required additional monitoring (7 states) or the criteria used for these decisions (5 states) <sup>a</sup>	12
State answer was ambiguous; it is unclear whether state has ever required more frequent monitoring after a treatment change <sup>b</sup>	7
States answered no, generally without elaboration <sup>c</sup>	16
States did not answer question or provided information that was nonresponsive <sup>d</sup>	4
<b>Total</b>	<b>50</b>

Source: GAO analysis of EPA's information request on state implementation policies and practices.

<sup>a</sup>For example, two states indicated that requiring more frequent monitoring was relatively common, while others reported that it was required in certain instances or occasionally. Examples of criteria for more frequent monitoring include (1) test results following a treatment change that are close to the lead action level and (2) installing treatment that is designed or expected to change water quality.

<sup>b</sup>Responses from these states referred to state regulations or policy (e.g., "this is embedded in the approval process") but did not directly answer the question of whether the state had ever required a system to conduct more frequent monitoring. In several instances, it seems likely that water systems have been required to monitor following a treatment change.

<sup>c</sup>Several states indicated that additional monitoring was recommended or encouraged following a treatment change but not required.

<sup>d</sup>Two states did not answer the question and the responses from the other two states only addressed monitoring requirements following changes to corrosion control treatment.

In our discussions with 10 states, we found a variety of policies and practices regarding reduced monitoring. For example, officials from California and New York told us that they do not approve reduced monitoring—or are reluctant to do so—when water systems' test results are close to the lead action level. On the other hand, Connecticut and Massachusetts officials indicated that they have systems that are on reduced monitoring despite test results close to the action level. Several

other states indicated that, in the case of large water systems, approval for reduced monitoring is linked to whether the systems are meeting their water quality parameters—not the results of lead monitoring. On the issue of monitoring following a major treatment change, some participants at EPA's monitoring workshop stated that standard compliance monitoring does not adequately evaluate the impact of treatment changes and that monitoring immediately after major changes should be required. Several of the states we contacted also favor increased monitoring under these circumstances; Florida and New York, for example, require systems to return to semi-annual monitoring following a treatment change. Pennsylvania officials agree that the state and water system should revisit the treatment approach when monitoring results indicate that a treatment change is affecting water chemistry. However, the officials acknowledged that they may not find out about the impact of treatment changes in a timely manner when water systems are on a triennial monitoring schedule.

## Homeowners Who Participate in Periodic Tap Sampling May Not Be Notified of the Test Results

According to EPA's information request on state implementation policies and practices, only two states require their water systems to notify homeowners of the results of lead testing—Texas (only when results exceed the action level) and Wisconsin. At least 17 other states indicated that notification may be occurring voluntarily to varying degrees. Table 7 summarizes the results of our analysis.

**Table 7: State Views on Extent to Which Water Systems Are Notifying Homeowners of the Results of Lead Testing**

Extent of notification	Number of states
All systems notify homeowners	1
Some systems notify homeowners <sup>a</sup>	15
Test results are provided only on request	2
State is not aware of any systems that notify homeowners	6
State does not know what systems are doing <sup>b</sup>	18
State apparently misinterpreted EPA's question <sup>c</sup>	8
<b>Total</b>	<b>50</b>

Source: GAO analysis of EPA's information request on state implementation policies and practices.



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<sup>a</sup>The states' answers varied considerably. For example, some states indicated that their larger water systems are providing results to homeowners and some indicated that homeowners got the results only if they exceeded the action level.

<sup>b</sup>In a few instances, the states indicated that they recommended that their water systems provide homeowners with test results. For example, Hawaii recommends notifying the homeowner if test results exceed 100 parts per billion, both to alert the homeowner and to verify that the sampling protocol was followed correctly. However, the states in this category did not have information on whether homeowners were actually getting test results.

<sup>c</sup>EPA asked if water systems provide homeowners with the lead sampling results derived from "any volunteer sampling program." Based on their answers, it appears that these states may have believed that EPA was asking about any testing above and beyond the regular sampling program involving residential tap samples. For example, several states said that they were not aware of any systems performing volunteer sampling programs and others indicated that their systems will conduct lead testing for homeowners on request.

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## Controls over When and How Treatment Changes Are Implemented May Not Be Adequate

In some instances, changes to other treatment processes can make corrosion control less effective. According to EPA, state, and industry officials, one of the biggest challenges in implementing the lead rule is achieving "simultaneous compliance" with other rules, including, in particular, rules related to total coliform bacteria, surface water treatment, and disinfection by-products. Changing the type of disinfectant a system uses to control bacteria, for example, can impair the effectiveness of a system's corrosion control treatment to prevent lead contamination. Among other things, states assuming primary enforcement responsibility must have a process for ensuring that the design and construction of new or substantially modified water system facilities will be capable of meeting drinking water regulations, including the lead rule.<sup>31</sup> In addition, in its minor revisions to the lead rule, EPA added a requirement that certain water systems must notify the state no later than 60 days after making a change in water treatment.<sup>32</sup> However, the responses to EPA's information request raise questions about the nature and extent of states' reviews of treatment changes. On the one hand, 31 states indicated that they had some type of proactive process to review or evaluate treatment changes, before or after the treatment was installed, including 15 states that reported requiring some or all of the affected water systems to provide information on the potential effects of treatment changes on corrosion control.<sup>33</sup> On the

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<sup>31</sup>40 C.F.R. § 142.10(b)(5).

<sup>32</sup>40 C.F.R. § 141.90(a)(3).

<sup>33</sup>Information provided by the remaining 19 states was unclear, generally because their responses were limited or based on a literal interpretation of EPA's question (e.g., states responded "in writing," when asked how systems notified the state about treatment changes).

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other hand, it appears that in at least 15 states, the plan review process may be limited, or the states may not be receiving notifications from all their water systems. For example, some states indicated that their review process only covers changes to a system's physical infrastructure—or specifically excludes changes in the chemicals used in a process. Other states reported that they are not learning of some treatment changes until they conduct comprehensive inspections of the water systems, or that small systems in particular are not notifying the state when they change their treatment processes.

Some of the participants in EPA's May 2004 workshop on simultaneous compliance cited a need for additional regulations or guidance to help ensure that the effectiveness of corrosion control is maintained when water systems make changes to other treatment processes. For example, some participants suggested that the lead rule should better define or even specify the types of treatment changes that (1) should be reported to the state and (2) trigger additional monitoring or analysis. Along those lines, Washington state officials told us that certain changes, such as switching the disinfectant from chlorine to chloramines or making adjustments that affect the water's pH or alkalinity, may warrant closer review because of the potential impact on corrosion control. The officials also noted that additional guidance from EPA on these matters would be helpful. Others believe that small water systems, in particular, need more guidance on the potential effects of various treatment changes, and that operator certification and training programs should be updated to address these topics.

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### Data on the Effectiveness of Lead Service Line Replacement Programs Are Limited

Under the lead rule, drinking water systems may be required to replace lead service lines if test results exceed the action level after installing corrosion control and/or source water treatment. Some of the participants in an EPA workshop on lead service line replacement and state officials we contacted raised questions about the effectiveness of replacement programs, in part because such programs often result in partial replacement only. Water systems are responsible for replacing only the portion of the service lines they own. While residential customers may, at their option, pay the cost of replacing the rest of the service line—typically, the portion running from the curb stop or property line to the household plumbing system—some evidence suggests that customer participation in such programs is generally low.

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According to workshop participants, little conclusive information is available on the extent to which removing lead service lines lowers lead levels at the tap. In a survey of water systems conducted for the American Water Works Association, 18 of 27 respondents indicated that lead service lines were not responsible for the highest levels of lead in drinking water, and 20 of 29 respondents reported no observed linkage between lead service lines and lead levels in drinking water.<sup>34</sup> However, the survey did not include information on test results before and after replacement of lead service lines. The American Water Works Association Research Foundation is sponsoring a study of the relative contributions of service lines and plumbing fixtures to lead levels at the tap; the projected completion is fall 2008.

The limited data on the extent and results of lead service line replacement programs make it difficult to draw conclusions about the programs' effectiveness or the need for additional regulations or guidance. As noted earlier, EPA's data on corrective action milestones—including the LSLR milestone—are incomplete. Moreover, few states reported requiring systems to replace lead service lines in response to EPA's information request on state implementation policies and practices. Specifically, when asked if they have any systems that have been required to do lead service line replacement, five states answered "yes" without elaborating and seven states reported a total of 27 water systems that are (or were) replacing lead lines.<sup>35</sup> In addition, although the lead rule requires testing following partial service line replacement, it appears that neither the states nor EPA are collecting and analyzing these test results. EPA asked states to describe the process they use to ensure that water systems are following the requirements for lead service line replacement. Among other things, the lead rule requires systems to collect samples within 72 hours following partial replacement and to notify homeowners and occupants of the results. States may waive the requirement that these test results also be provided to the states. Of the 12 states that reported requiring one or more water systems to replace lead service lines, only one indicated that its

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<sup>34</sup>Overall, 65 water systems with lead service lines were included in the survey. Although a total of 41 systems responded to the survey, the number of responses to individual questions varied.

<sup>35</sup>In addition, nine states reported that one or more of their water systems were replacing lead service lines voluntarily (including one state that also reported requiring systems to replace lead lines). Two more states reported that systems with lead goosenecks, which connect water mains to the service lines, have either replaced the goosenecks or are doing so as they are discovered.

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water systems might be required to report the results of service line testing to the state.<sup>36</sup>

Some of the officials we contacted raised concerns about whether the benefits of replacement are enough to justify what can be a significant investment. For example, Iowa drinking water officials commented that partial replacement is not a good use of resources because it disturbs the line, releasing lead particulate matter into the water, and still leaves half the lead line in place. In addition, officials from the Syracuse Water Department told us that they are planning to replace lead service lines at a cost of \$5.3 million, although they are skeptical that the effort will significantly reduce lead levels, citing the age of the housing stock and lead contributions from internal residential plumbing. The officials attribute the city's problem with elevated lead levels to a simultaneous compliance issue. Specifically, adding a phosphate-based corrosion inhibitor to further reduce the corrosiveness of the drinking water solves one problem but creates another: excessive phosphates in the system's discharges to a local lake.

Participants at EPA's workshop on lead service line replacement and some of the state and water industry officials we contacted suggested measures to help ensure that water systems maximize the potential benefits of replacement efforts. For example, some workshop participants called for EPA guidance on strategies to encourage full service line replacement and motivate customers to have their portion of the line removed. Such strategies might include subsidizing a portion of the replacement cost, offering low interest loans or property tax relief, requiring disclosure of lead service lines in property sales, or providing more information on the health effects of exposure to lead in drinking water. Others suggested that prioritizing the replacement of lead service lines would help ensure that replacement activities focus on the populations most at risk from exposure to elevated lead levels. Some utilities are already prioritizing service line replacement using criteria such as locations with vulnerable populations, including schools and child care facilities, locations where test results have exceeded the action level, and lines serving 20 or more people in an 8-hour day.

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<sup>36</sup>Another two states said that they issued regulations or provided guidance instructing systems to comply with the testing requirements; three states indicated that they review a system's replacement program during periodic inspections; and six states did not provide any information regarding their oversight of lead service line testing.

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## States Vary in How They Apply the Lead Rule When Water Systems Sell Drinking Water to Other Systems

We found some differences among the states in how interconnected water systems—generally comprising a system that sells drinking water along with one or more systems that buy the water—are required to monitor for lead and report the results. According to EPA's proposed definitions, these interconnected water systems are known as "combined water distribution systems."<sup>37</sup> The variations in state implementation practices create differences in the level of public information and, potentially, public health protection. Combined distribution systems account for a large and growing share of the nation's community water systems so differences in how they implement the lead rule could have broad implications for public health protection. Overall, EPA estimates that there are currently about 2,800 combined distribution systems that encompass about 13,900 individual systems, likely accounting for a significant share of all community water systems.<sup>38</sup> Under EPA regulations that establish general requirements for drinking water monitoring, states may modify the monitoring requirements imposed on combined distribution systems—typically by reducing the number of samples required within the combined system—"to the extent that the interconnection of the systems justifies treating them as a single system for monitoring purposes."<sup>39</sup> However, in the case of the lead rule, EPA strongly discouraged such modifications, commenting that they would not be appropriate because the primary source of elevated lead levels at the tap is materials within the distribution system.

At least four of the states we contacted—Massachusetts, Michigan, Oregon, and Washington—approved modified sampling arrangements at combined distribution systems. For example, the Massachusetts Water Resources

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<sup>37</sup>Under EPA's proposed definitions, a "water wholesaler" is a water system that sells or otherwise delivers treated water to another system on a regular basis (at least 60 days per year); a "consecutive system" is a system that buys or otherwise receives some or all of its treated water from another water system at least 60 days per year. EPA defines the totality of the distribution systems of all interconnected wholesale and consecutive systems as a combined distribution system.

<sup>38</sup>We were unable to confirm the actual number of community water systems in EPA's estimate. According to EPA, they are in the process of developing better data on the number and type of water systems involved in combined distribution systems.

<sup>39</sup>40 C.F.R. § 141.29. EPA must concur with modified monitoring arrangements.

Authority, which supplies all of the drinking water for 30 communities,<sup>40</sup> currently takes lead samples at 440 locations under its modified sampling arrangement—significantly fewer than the 1,720 samples that would be required if each of the consecutive systems tested for lead individually. On the other hand, if the combined distribution system represented a single water system, only 100 samples would be required.

EPA does not have comprehensive information on the extent to which states are approving modified sampling arrangements at combined distribution systems—or the reporting practices used by such systems. As table 8 shows, we found differences in how combined distribution systems calculated and reported their 90<sup>th</sup> percentile test results.

**Table 8: Examples of Different Reporting Practices for Lead Testing in Combined Water Distribution Systems as of June 2005**

Water wholesaler	Number of consecutive systems fully supplied by the wholesaler <sup>a</sup>	How the systems are listed in EPA's database	How the 90 <sup>th</sup> percentile lead levels are calculated and reported in EPA's database
Detroit, MI	72	Wholesaler and each consecutive system are listed separately	Separate lead level calculations for the wholesaler and each consecutive system
Massachusetts Water Resources Authority (MA)	30	One listing for the combined distribution system (including the wholesaler and the consecutive systems)	One overall result, reported for the combined distribution system
Philadelphia, PA	3	Wholesaler and each consecutive system are listed separately	Separate lead level calculations for the wholesaler and each consecutive system
Portland, OR	15	Wholesaler and each consecutive system are listed separately	One overall result; same 90 <sup>th</sup> percentile reported for wholesaler and each consecutive system
Seattle, WA	19	One listing for the combined distribution system (including the wholesaler and the consecutive systems)	One overall result, reported for the combined distribution system

Source: GAO analysis of data from EPA and the wholesaler water systems.

<sup>40</sup>According to a Massachusetts Water Resources Authority official, the 30 communities receive corrosion control from the Authority and are part of the modified sampling arrangement approved by the Massachusetts Department of Environmental Protection. The Authority also provides more limited services to 17 other systems, including water that is mixed with local supplies in some cases and emergency water supplies in other cases. Each of these other systems has its own lead rule compliance program.

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<sup>a</sup>The water wholesalers may also partially supply other systems or provide emergency supplies, and may sell water to certain non-transient, noncommunity water systems—systems that serve at least 25 people for more than 6 months in a year—and generally are subject to the same requirements as community water systems.

Not only do the reporting practices approved by the states affect the amount of information available to the public—they can also have implications for the corrective actions that are taken to reduce lead levels. For example, reporting one overall result for lead testing can be misleading if the 90<sup>th</sup> percentile levels at individual consecutive systems would have exceeded the action level. In the case of the Massachusetts Water Resources Authority, although EPA's database contains the overall result for the combined system, authority officials calculated the 90<sup>th</sup> percentile results for each of the consecutive systems and determined that lead concentrations at some of them exceeded the action level.<sup>41</sup> State officials in Massachusetts told us that until recently, none of the consecutive systems whose individual test results exceeded the action level were required to meet public notification or public education requirements or to replace lead service lines—as long as the result for the combined system met the action level. Although EPA regional officials concurred with such arrangements when they were first established, EPA is now considering how to ensure that the lead rule requirements will be applied to each community within a combined distribution system. Based on discussions with EPA regional officials, Massachusetts has already changed its policy and will be revisiting agreements with combined distribution systems.

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### Outdated Plumbing Standards Hinder Efforts to Reduce Exposure to Lead in Drinking Water

The standards applicable to plumbing products are important to utility managers who are responsible for ensuring the quality of water at the tap but have little control over household plumbing. However, existing standards may not be protective enough, according to some experts, because testing has determined that some of the products defined as “lead-free” under the Safe Drinking Water Act can still contribute high levels of lead to drinking water. For example, although the act prohibits the use of solder or other plumbing materials in the installation or repair of any public water system if it is not lead-free, lead-free is defined to include materials that contain small amounts of lead. That is, solders and flux may contain up to 0.2 percent lead, pipes and pipe fittings may contain up to 8 percent lead.

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<sup>41</sup>In this case, the individual communities did notify their customers of the 90<sup>th</sup> percentile results for the applicable consecutive system. However, EPA's database does not contain this information so it is not readily available to the public at large.

In addition, plumbing fittings and fixtures may leach lead up to 11 parts per billion into drinking water and still be deemed lead-free, according to voluntary standards established by an independent organization and accepted by EPA.<sup>42</sup>

NSF International (NSF)—a not-for-profit, non-governmental organization involved in standards development and product certification—established the standard in 1997.<sup>43</sup> NSF used a voluntary consensus process that included representatives from regulatory agencies, industry, water suppliers, consultants, and other users of the products governed by the standard.

One problem with the current regulatory framework is that certain devices used in or near residential plumbing systems are not covered by all standards for lead-free plumbing. Table 9 shows how the standards governing lead content and lead leaching apply to specific categories of products.

**Table 9: Applicability of Standards for Lead-Free Plumbing Products**

Type of plumbing product	8% limit on lead content	11 ppb limit on lead leaching
Endpoint devices, such as kitchen and lavatory faucets, water dispensers, drinking fountains, and residential refrigerator ice makers <sup>a</sup>	X	X
In-line devices, such as meters and valves <sup>b</sup>	X	

Source: EPA and NSF International.

<sup>a</sup>NSF defines endpoint devices as mechanical plumbing devices, components, and materials that are typically installed with the last liter of the distribution system and are intended by the manufacturer to dispense water for human consumption.

<sup>b</sup>NSF defines in-line devices as devices installed on a service line of building distribution system downstream of the water main and before endpoint devices. They include devices in a building used to measure or control the flow of water in treatment, transmission, or distribution systems and are in contact with drinking water.

<sup>42</sup>42 U.S.C. § 300g-6(a),(d),(e).

<sup>43</sup>See NSF, *ANSI/NSF Standard 61: Drinking Water System Components – Health Effects* (Ann Arbor, Mich.: 1997). NSF focuses on food, water, indoor air, and the environment. NSF is accredited by the American National Standards Institute (ANSI) to provide third-party certification to NSF Standard 61.



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Some of the products that are not covered by the voluntary leaching standard have been found to contribute high levels of lead to drinking water during testing. For example, tests conducted by NSF indicate that certain meters and valves may contribute high levels of lead to drinking water. At our request, NSF compiled test results for a nonprobability sample of water meters and valves that had been submitted for evaluation. While all of the products in the sample were well below the 8 percent limit on lead content, the test results showed that the amount of lead leached from the selected water meters ranged from 0.4 parts per billion up to 39 parts per billion and, in the case of valves, ranged from a low of 4.1 parts per billion to as much as 530 parts per billion. An NSF official commented that although these products are representative of what is submitted to NSF for testing, they are probably not representative of what is available in the marketplace because some manufacturers have two product lines—a low-lead line for buyers who specify products that meet NSF Standard 61 and a higher-leaded line for other buyers.

Another issue is that NSF's testing protocol for lead leaching may not accurately reflect actual conditions and may need to be modified. One recent study identified several aspects of NSF's testing protocol that should be reevaluated, including, for example, the chemistry of the water in which tests are conducted. After demonstrating that potentially unsafe devices could pass NSF's test, the study concluded that the protocol "lacks the rigor necessary to prevent installation of devices that pose an obvious public health hazard."<sup>44</sup> NSF officials told us that they are aware of the concerns and have already made some clarifications and changes to the protocol. NSF has also established a task force, the Drinking Water Additives Joint Committee, which will be reviewing the protectiveness of NSF Standard 61 and related testing.

Representatives of NSF, water utilities, and researchers also took issue with the standard for lead content, noting that it has not been updated to reflect current manufacturing capabilities and practices. According to the American Water Works Association, manufacturing technology in the plumbing industry has improved since the lead-free definition was established nearly 20 years ago, and today's plumbing products contain less lead as a result. Data on the lead content of plumbing products voluntarily submitted to NSF for evaluation, shown in table 10, suggest that

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<sup>44</sup>Dudi, A., Schock, M., Murray, N., and Edwards, M., *Lead Leaching from Inline Brass Devices: A Critical Evaluation of the Existing Standard*, Journal AWWA (August 2005).

manufacturers can produce products with lead levels well below the 8 percent standard.

**Table 10: Summary of NSF Test Results Regarding Lead Content of Plumbing Products Voluntarily Submitted to NSF for Certification**

Lead content	Results of testing on faucets		Results of testing on meters and valves	
	Cumulative number	Cumulative percent	Cumulative number	Cumulative percent
1.0% or less	2,069	37.3	930	75.1
3.7% or less	5,495	99.0	1,104	89.1
8.0% or less	5,551	100.0	1,236	99.8
<b>Total products tested</b>	<b>5,551</b>	<b>100.0</b>	<b>1,239</b>	<b>100.0</b>

Source: NSF.

Note: This table contains cumulative data on the number and percent lead content of faucets, meters, and valves voluntarily submitted to NSF for certification. The data should not be generalized beyond this group.

According to NSF, the extent to which lead leaches from products containing lead is not directly proportional to the level of lead used in any one alloy contained in the product.<sup>45</sup> NSF identified several factors that contribute to the level of leaching, including the corrosiveness of the water, lead content, the extent of the leaded surface area, and the process used to manufacture the product. However, the state regulators, water industry representatives, and other experts we interviewed generally agreed that lowering the existing standard for lead content is feasible and would provide an extra margin of safety. Both the Copper Development Association and the Plumbing Manufacturers Institute acknowledged that most plumbing products are below the 8 percent limit on lead content but prefer that plumbing standards focus on performance—the leaching of lead—rather than content.

We did not attempt to determine the extent to which the standards for lead-free plumbing products are enforced. According to NSF, the use of plumbing products within a building is generally regulated at the state, county, and city levels through plumbing codes. NSF representatives also said that all model plumbing codes reference NSF Standard 61 for pipes,

<sup>45</sup>McLellan, C., Purkiss, D., and Greiner, P., *Interim Report on Extraction Results on Leaded Products Submitted for Evaluation Under NSF/ANSI 61*, NSF International (Ann Arbor, Mich.: June 2005).

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fittings, and faucets.<sup>46</sup> NSF reports that most faucets sold at the retail and wholesale level are certified to meet Standard 61, but fewer valves and other in-line devices are certified to the standard because it is not required in model plumbing codes.

State efforts to implement more stringent standards for plumbing products appear limited, based on our discussions with federal and state regulators and representatives of the water industry and plumbing manufacturers. We identified two states in which such activities have occurred:

- In California, the Attorney General sued 16 manufacturers and distributors of kitchen and bathroom faucets in the early 1990s, alleging that lead leaching from brass components of their faucets violated California law.<sup>47</sup> The suit resulted in settlement agreements with the companies and a related court decision in which they agreed to reduce leaching levels. According to an official with the California Attorney General's Office, the limit on lead leaching is 5 parts per billion for residential kitchen faucets and 11 parts per billion for all other faucets.
- According to officials with the Massachusetts Board of State Examiners of Plumbers and Gas Fitters, in 1995 the board established a 3 percent limit on the lead content of endpoint and in-line devices installed inside the home. Board officials acknowledge that enforcement of the standard is difficult because products containing more than 3 percent lead may be sold in Massachusetts stores as long as the products are not installed in Massachusetts homes. Moreover, the packaging does not indicate lead content or certification to the state standard.

At the local level, some water systems are installing no-lead meters—which contain less than 0.25 percent lead—because of concerns about the potential impact of leaded brass meters on lead levels at the tap. In some instances, the water systems are targeting their meter replacement to buildings housing schools and child care facilities.

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<sup>46</sup>Model plumbing codes include the International Plumbing Code and the United Plumbing Code.

<sup>47</sup>See Cal. Safety & Health Code § 25249.5 (part of the initiative known as Proposition 65 adopted by popular vote in 1986).

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## EPA Is Considering Modifications to the Lead Rule to Address Some Problem Areas

Based on its year-long evaluation of the lead rule and how it is being implemented, EPA concluded that the conditions that led to elevated lead levels in the District of Columbia were not indicative of the conditions nationwide. However, in November 2004, while its evaluation was still ongoing, EPA issued a guidance memorandum to reiterate and clarify specific regulatory requirements after the agency's review of state programs and some press reports identified inconsistencies in how drinking water systems and the states were carrying out the regulation. The memorandum focused on requirements related to collecting samples and calculating compliance. In addition, in March 2005, EPA announced a Drinking Water Lead Reduction Plan to improve and clarify specific areas of the rule and the agency's guidance materials. The plan identifies nine targeted revisions of the regulations and updates to two guidance documents.

Specifically, EPA's lead reduction plan calls for regulatory revisions to the following:

- **Monitoring requirements.** These revisions would (1) clarify the number of samples required, (2) clarify the number of locations from which samples should be collected, (3) modify definitions of "monitoring period" and "compliance period," (4) clarify the requirement to take all samples within the same calendar year, and (5) reconsider allowing large water systems that exceed the lead action level to qualify for reduced monitoring as long as their test results for water quality parameters are within acceptable limits.
- **Treatment requirements.** These revisions would require water systems to notify the state of treatment changes 60 days prior to the change rather than within 60 days following the change.
- **Customer awareness requirements.** These revisions would (1) require water systems to disclose test results to homeowners and occupants who participate in tap monitoring programs and (2) permit states to allow water systems to modify flushing instructions—the amount of time that homeowners are advised to run water before using it—to address local circumstances.
- **Lead service line replacement requirements.** These revisions would require water systems to reevaluate lead service lines that previously "tested out" of the replacement program as a result of low lead levels if a

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subsequent treatment change causes the systems to exceed the action level.<sup>48</sup>

In addition, EPA is considering updating its 1994 guidance on lead in drinking water in schools and non-residential buildings, along with its 1999 guidance on simultaneous compliance.

So far, EPA has not released additional details on the nature of the changes being considered in some areas (e.g., number of samples and sampling locations) or what prompted its determination that revisions to the lead rule and related guidance might be warranted. An EPA workgroup, which was established when the lead reduction plan was issued, is developing the proposed rule for the regulatory changes, with a goal of releasing a proposal in late 2005 or early 2006. Revisions to the guidance documents are scheduled to be completed about the same time.

While the exact nature of some changes has yet to be defined, we asked the 10 states we contacted for their views on whether the proposed revisions would improve implementation of the lead rule. For the most part, state officials were in favor of the proposed changes involving the monitoring protocols. Although they wanted more details on how the requirements would be revised, they believed the changes to be relatively minor. In particular, most state officials agreed that large water systems that exceed the action level should not be allowed to reduce the frequency of lead monitoring based solely on their ability to meet water quality parameters.

Regarding earlier notification of treatment changes, officials from all 10 states we contacted supported such a revision, particularly for major treatment changes. The officials indicated that the notification requirement would not have a significant impact on their own practices because each of the states already had some type of process in place to permit or review treatment changes. Five of the states questioned whether 60 days advance notice would be sufficient to allow an adequate review. Several states suggested that EPA should require expedited monitoring of lead levels following major treatment changes—or issue guidance on when it would be appropriate for states to require such monitoring—and that EPA should issue guidance on what constitutes a major treatment change. In addition,

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<sup>48</sup>Under the lead rule, water systems are not required to replace an individual lead service line if the lead concentration in all service line samples from that line is less than or equal to 15 parts per billion. This is sometimes referred to as the “test-out” provision.

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officials from two states commented that EPA should require state approval of the treatment changes in addition to advance notification.

On the proposed revisions involving customer awareness, all 10 states agreed that homeowners that participate in the tap sampling program should be informed of the test results—particularly if the results for individual homeowners exceed the lead action level—whether or not the 90<sup>th</sup> percentile result for the entire system exceeds the action level. One state was concerned about the additional resources that would be required to track the water systems' actions. Nearly all of the states also endorsed the proposal to give states and water systems more flexibility in determining what flushing instructions are appropriate in particular situations. Some states suggested that EPA guidance on making such determinations would be useful.

Regarding the proposed reevaluation of lead service lines that tested out of a replacement program, the states' views were mixed. Although five states generally endorsed the idea, the other five states raised several concerns, including the potential cost to local drinking water systems, the administrative burden that such a requirement would impose on states, and the need for more specific information on the types of treatment changes that would trigger a reevaluation of lead service lines.

Over the long term, EPA plans to examine other issues related to lead rule implementation that may need to be addressed through regulation or guidance. EPA officials have indicated that, in some instances, they need more information to determine whether changes are warranted, and they are in the process of collecting and analyzing data, or have relevant research projects underway. According to EPA officials, some of the issues they plan to review include the sampling protocol, monitoring and reporting requirements for consecutive systems, the impact of disinfection treatment on corrosion control, and the requirements for lead service line replacement.

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## Limited Data Indicate Few Schools and Child Care Facilities Test or Take Other Measures to Control Lead in Their Water Supplies

Little information exists on the results of activities initiated after enactment of the Lead Contamination Control Act (LCCA) of 1988, including the recall of lead-lined water coolers from schools and child care facilities. More recent efforts to detect and remediate lead in the drinking water at such facilities also appear limited. As a result, the extent to which drinking water may contain unacceptable levels of lead at schools and child care facilities nationwide is uncertain. In addition, no clear focal point exists at the federal or state level to collect and analyze the results of testing and remediation efforts. Moreover, state and local officials say that addressing other environmental hazards at schools and child care facilities takes priority over testing for lead in drinking water.

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## Little Information Exists on the Results of the Recall of Lead-Lined Water Coolers and Other Activities Prompted by the LCCA

The LCCA, enacted in 1988, laid out a number of requirements for EPA, the Consumer Product Safety Commission, and the states to address the potential risks of lead contamination in water supplies serving schools and child care facilities. Among other things, the act

- banned the manufacture and sale of drinking water coolers containing lead-lined tanks and other water coolers that are not lead-free,
- required EPA to publish a list of such coolers and distribute it to the states along with guidance on testing for and remedying lead contamination in drinking water, and
- required the Consumer Product Safety Commission to issue an order requiring manufacturers and importers to (1) repair or replace the coolers or (2) recall and provide a refund for them because coolers containing lead-lined tanks were deemed to be imminently hazardous consumer products.

In addition, the LCCA required states to establish programs to assist local agencies in addressing potential lead contamination. While the nature and extent of state activities varied widely, the program was never funded, according to EPA officials. In 1996, the requirement was determined to be unconstitutional.<sup>49</sup>

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<sup>49</sup>See *ACORN v. Edwards*, 81 F.3d 1387 (5<sup>th</sup> Cir. 1996).

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To support the required recall, EPA identified six models of water coolers containing lead-lined tanks, all produced by one company and manufactured prior to April 1979. EPA could not obtain information on the number of units produced. The Consumer Product Safety Commission broadened the recall order to include all tank-type models of drinking water coolers manufactured by the company, whether or not the models were included on EPA's list.<sup>50</sup> Under the terms of the order, the manufacturer established a process under which qualified owners of the affected coolers could request a refund or replacement. The manufacturer was also required to notify appropriate officials and organizations, including state and school officials and day care centers, about the recall and the availability of refunds and replacements.

Little information is available to determine the effectiveness of the recall effort in removing lead-lined water coolers from service.<sup>51</sup> Not only is the number of coolers affected by the recall unknown, but the Consumer Product Safety Commission did not have summary data on the results of the recall. An agency official confirmed information in a 1991 Natural Resources Defense Council report that, as of 1990, the Commission had received approximately 1,200 inquiries about the recall, 1,373 coolers had been determined to be eligible for replacement, 514 had been replaced, and 105 refunds had been mailed to customers.<sup>52</sup> However, the official also said that many more coolers were replaced after that date and that by 1993, the manufacturer had received approximately 11,000 inquiries about the recall. The official believed that the actual number of replacements was potentially 10 times greater than those reported in 1991 and the refunds four to five times greater. In addition, the recall order did not specify an end date for filing a refund or replacement request so an unknown number of coolers could have been taken out of service without the knowledge of the manufacturer or the Commission subsequent to 1993.

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<sup>50</sup>55 Fed. Reg. 22387 (June 1, 1990).

<sup>51</sup>Under the terms of the recall order, the manufacturer was required to (1) provide periodic reports to the Commission for 3 years, including information on the number of replacements shipped and refunds mailed, and (2) maintain records related to the recall for 5 years.

<sup>52</sup>Natural Resources Defense Council, *The Lead Contamination Control Act: A Study in Non-Compliance* (June 1991). Because this study is used for context purposes, we did not assess its reliability.



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According to several state and school officials we interviewed, virtually all of the water coolers affected by the recall have been replaced or removed, either as a result of the publicity surrounding the recall or because they had already been taken out of service. Some of the six models covered by the recall were manufactured in the 1950s and 1960s and are likely to have been retired because of their age or maintenance problems.

Beyond the recall effort, little or no data are available to assess the effectiveness of other actions taken in response to the LCCA. For example, little information is available on the extent to which schools and child care facilities were inspected to check potential lead contamination from water coolers that were not lead-free. While the act did not require EPA or the states to track or report on the results of testing, EPA was responsible for publishing guidance and a testing protocol to assist schools in determining the source and degree of lead contamination in school drinking water supplies and remedying such contamination. EPA published guidance for both schools and child care facilities in 1989 and 1994, respectively.<sup>53</sup>

We found no information indicating how pervasive lead-contaminated drinking water in such facilities nationwide or within particular states might be, but several studies conducted in the early 1990s contained some limited information on testing efforts:

- In 1993, we reported on the results of a survey of 57 school districts in 10 states.<sup>54</sup> We found that 47 districts were able to provide data on the results of testing, which showed that about 15 percent of the 2,272 schools tested had drinking water containing levels of lead considered unacceptable by EPA. We also contacted child care licensing agencies in 16 states to obtain information on their activities for addressing lead hazards and found that none of the agencies routinely inspected child care facilities for such hazards.

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<sup>53</sup>EPA published the first guidance document in 1989. See EPA Office of Water, *Lead in School's Drinking Water*, EPA 570-9-89-001 (Washington, D.C.: Jan. 1989). EPA updated the guidance in 1994. See EPA Office of Water, *Lead in Drinking Water in Schools and Non-Residential Buildings*, EPA 812-8-94-002 (Washington, D.C.: Apr. 1994). Also in 1994, EPA published a separate guidance document to address child care facilities. See EPA Office of Water, *Sampling for Lead in Drinking Water in Nursery Schools and Day Care Facilities*, EPA 812-B-94-003 (Washington, D.C.: Apr. 1994).

<sup>54</sup>GAO, *Toxic Substances: The Extent of Lead Hazards in Child Care Facilities and Schools Is Unknown*, GAO/RCED-93-197 (Washington, D.C.: Sept. 14, 1993).

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- A 1990 report by EPA's Inspector General found that, of the 13 school districts surveyed, 10 conducted some testing for lead in drinking water and 8 detected contamination, with some results exceeding acceptable levels by a wide margin.<sup>55</sup>
  - According to the Natural Resources Defense Council's 1991 study,<sup>56</sup> 47 states reported some testing of school drinking water supplies, including 16 states that tested in "a few" to 25 percent of their schools, 27 states that tested from 25 percent to 82 percent of the schools, and 4 states that tested 95 percent or more of their schools. The study also found that 17 states reported testing at child care facilities.

In addition to these earlier studies, in 2004 EPA asked the states to provide information on current state and local efforts to monitor and protect children from lead exposure in drinking water at schools and child care facilities.<sup>57</sup> As part of that effort, seven states also reported on the results of local testing following passage of the LCCA, stating that elevated lead levels were found in at least some of the locations tested.<sup>58</sup> However, the states differed significantly in the extent of their testing and how they summarized the results. In five of the states, the results generally ranged from about 1 percent to 27 percent of samples, facilities, or districts with lead levels considered unacceptable by EPA—but the other two states finding elevated lead levels used a different assessment measure.

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<sup>55</sup>EPA Office of the Inspector General, *Report of Audit on the Lead in Drinking Water Program*, Report No. E1HWF9-03-0316-0100508 (Washington, D.C.: Sept. 28, 1990).

<sup>56</sup>*The Lead Contamination Control Act: A Study in Non-Compliance*, pp. 6-7.

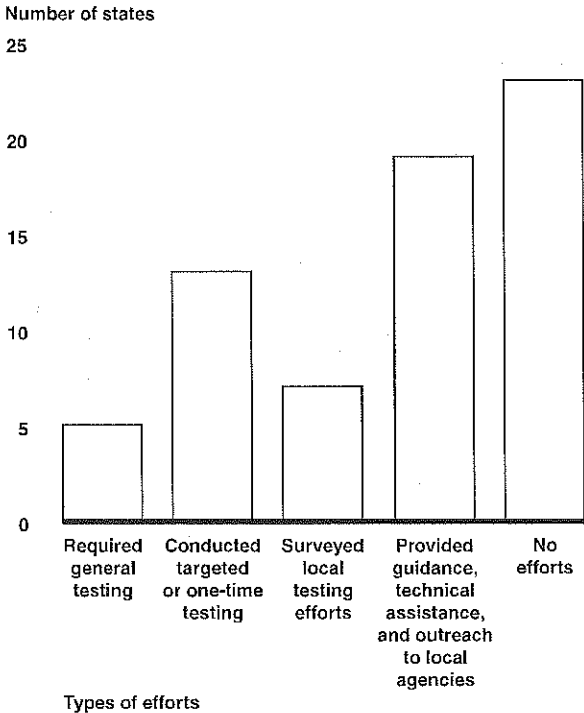
<sup>57</sup>EPA, *Controlling Lead in Drinking Water for Schools and Day Care Facilities: A Summary of State Programs*, EPA-810-R-04-001 (Washington, D.C.: July 2004).

<sup>58</sup>Although not reported in response to EPA's information request, Washington state also conducted a survey of school testing shortly after the LCCA was enacted and found that 25 percent of 121 schools that conducted testing detected unacceptable levels of lead in one or more drinking water outlets.

Current Efforts to Detect and Remediate Lead in Drinking Water at Schools and Child Care Facilities Also Appear Limited

The extent of current testing and remediation activities for lead in school and child care facility drinking water appears limited. The LCCA does not require states to track or report such activities and, based on the information that EPA collected from the states in 2004 and our own contacts in 10 states, few states have comprehensive programs to detect and remediate lead in drinking water at schools and child care facilities. Figure 4 shows the nature and extent of these activities; about half the states reported no current efforts.

Figure 4: Summary of State Efforts to Address Lead in Drinking Water at Schools and Child Care Facilities



Source: EPA and selected states.

Notes: (1) All states but Colorado responded to EPA's information request; about half the states submitted multiple responses, generally because responsibility for addressing lead issues at schools and child care facilities is shared by both health and environmental agencies.

(2) The figure summarizes the most frequently reported activities by the states. While nearly half the states reported no activities, others reported activities in more than one of the categories we used. In addition to the activities summarized in figure 4, 26 states reported having lead poisoning prevention programs that include testing blood lead levels of children and investigating the source of any problems identified. We did not include these programs in our summary because the investigations usually focus

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initially on a child's home environment and the presence of lead paint. However, they could ultimately involve testing the drinking water at schools or child care facilities.

(3) Some states reported testing for lead at schools or child care facilities that have their own water systems. We did not include this activity in figure 4 because such testing is required under the Safe Drinking Water Act.

Of the five states that reported having testing requirements, four—Connecticut, New Hampshire, South Carolina, and Vermont—require child care facilities to test their drinking water for lead contamination when obtaining or renewing their licenses.<sup>50</sup> In the fifth state (Massachusetts), the testing requirement focuses on schools. Water systems must include two schools among their sampling sites in each round of lead testing, although the school data are not included in the 90<sup>th</sup> percentile calculation to determine whether lead levels exceed the action level. Massachusetts officials told us that, although the testing requirement has been in place since 1992, it has not received much attention until recently. The officials acknowledged that most water systems repeatedly used the same schools as sampling sites for the sake of convenience and said that the state has never summarized the results of the school testing. Given the renewed concerns about lead contamination following the detection of lead in the District of Columbia's drinking water, Massachusetts now requires water systems to rotate testing among schools and child care facilities and plans to issue a summary report at the end of 2005.

In addition to these requirements, Florida's Department of Environmental Protection reported to EPA that it had established a voluntary program. Specifically, the state designated child care facilities as Tier 1, high risk sites and gave water systems the option of using the facilities as lead sampling sites and including them in the calculation of the 90<sup>th</sup> percentile lead level. (According to a Florida official, to be included as a sampling site, the child care facility must meet other Tier 1 criteria, such as being served by a lead service line.) However, when we followed up with state officials, they said that they had no way of tracking the extent to which water systems were actually including child care facilities as sampling sites.

The scope of the targeted testing reported by 12 states varied widely, from a single school district in Pennsylvania to over 1,300 homes and child care facilities in Indiana. Several states indicated that they were focusing on potential high risk locations. EPA regional offices helped to initiate some limited testing in a few states, including Massachusetts, New Jersey, New

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<sup>50</sup>In New Hampshire, the testing requirement applies only to facilities that care for 24 or fewer children and have their own independent water supply.

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York, and Pennsylvania; the testing generally focused on a few of the states' largest school districts. The state-sponsored surveys to determine the status of testing by local agencies also varied, with some covering all schools within the state and others focusing on a smaller subset of schools. In Washington, the state recently set aside \$750,000, including \$400,000 from its drinking water state revolving fund, to partially reimburse school districts for the cost of monitoring for lead in elementary schools' drinking water.

EPA officials attributed the relatively low level of state activity in recent years to the aftereffects of a 1996 lawsuit brought by the Association of Community Organizations for Reform Now against the state of Louisiana for not doing enough to implement the LCCA. The case resulted in a federal circuit court decision declaring that part of the LCCA was unconstitutional. Specifically, the court ruled that the federal government did not have the authority to require states to establish a remedial action program as outlined in the LCCA.<sup>60</sup> While Louisiana reported to EPA that the case "had the unintended effect of ending the lead program in schools for the state of Louisiana," none of the 10 states we contacted cited the ruling as a factor in limiting their efforts.

To obtain more information about testing and remedial actions in individual cities, we contacted five school districts—Boston, Detroit, Philadelphia, Seattle, and Syracuse. Table 11 shows the extent and results of testing within each district, and provides information on the various approaches school administrators have used to address the lead contamination.

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<sup>60</sup>See *ACORN v. Edwards*, 81 F.3d 1387 (5<sup>th</sup> Cir. 1996).

**Table 11: Information on Recent Efforts to Test for and Remediate Lead in Drinking Water in Five School Districts**

School district	Scope and results of testing	Type and cost of remedial actions
Boston, Mass. Public Schools <sup>a</sup>	<p><u>Scope:</u> Testing focused on kitchen facilities used to prepare food and was conducted between 2003 and 2004 at the district's central kitchen facility and 38 schools with on-site kitchen facilities.</p> <p><u>Results:</u> Lead levels in water from 17 kitchen facilities, including the central kitchen, exceeded 20 ppb.</p>	<p><u>Actions:</u> Manual flushing for at least 1 minute each day in all kitchens and an automatic flushing program at the central kitchen and 22 school buildings with kitchen facilities.</p> <p><u>Cost:</u> Not available.</p>
Detroit, Mich. Public Schools	<p><u>Scope:</u> The district tested 21 water fountains and other outlets in one middle school as of November 2002. (Testing was also conducted at one other middle school, but the number of outlets included was not available.)</p> <p><u>Results:</u> Lead levels in water from 16 drinking water outlets in one middle school exceeded 15 ppb.</p>	<p><u>Actions:</u> For the short term, shutting off outlets with elevated lead levels, doing manual flushing, and providing bottled water. For the long term, installing a water treatment system, replacing lead piping and fixtures, and re-routing a service line serving the school.</p> <p><u>Cost:</u> An estimated \$9,000 for bottled water and \$5,865 for the water treatment system, plus \$800 in annual maintenance costs.</p>
Philadelphia, Pa. School District <sup>b</sup>	<p><u>Scope:</u> As a result of consent orders in 1999 and 2000, the school district was required to test all drinking water outlets at 299 schools and other buildings, or about 30,000 outlets in total.<sup>c</sup></p> <p><u>Results:</u> As of March 2004, the district had detected lead levels over 20 ppb in approximately 4,600, or roughly 15 percent, of the outlets tested.</p>	<p><u>Actions:</u> For the short term, shutting off outlets with elevated lead levels and providing bottled water. For the long term, replacing or removing fixtures.</p> <p><u>Cost:</u> An estimated \$6 million through February 2005.</p>
Seattle, Wash. Public Schools <sup>d</sup>	<p><u>Scope:</u> In 2004, the district tested all interior drinking water outlets considered suitable for use, about 2,400 outlets in total.</p> <p><u>Results:</u> Lead levels at 600 of the outlets, or 25 percent, exceeded 20 ppb.</p>	<p><u>Actions:</u> For the short term, shutting off outlets with elevated lead levels and providing bottled water. For the long term, fixing or replacing fixtures, installing filters, and replacing piping for any outlet where lead levels exceeded 10 ppb.</p> <p><u>Cost:</u> An estimated \$15 million upon completion in 2007.</p>

(Continued From Previous Page)

School district	Scope and results of testing	Type and cost of remedial actions
Syracuse, N.Y. City School District	<p><u>Scope:</u> The district tested specific interior drinking water outlets in 50 schools and other buildings, beginning in August 2003.</p> <p><u>Results:</u> 23 of the facilities had at least one drinking water outlet with lead levels over 20 ppb.</p>	<p><u>Actions:</u> For the short term, shutting off outlets with elevated lead levels. For the long term, installing in-line carbon filters at each outlet with elevated lead levels. (Other measures such as pipe replacement and removal of fixtures are still under discussion.)</p> <p><u>Cost:</u> An estimated \$100,000 through March 2005.</p>

Source: EPA and school districts.

<sup>a</sup>Boston officials told us that they focused on kitchen facilities in their most recent testing because the district had already installed bottled water at many drinking water outlets after earlier testing had disclosed elevated lead levels.

<sup>b</sup>Both Philadelphia and Seattle had also conducted some testing prior to the more recent efforts summarized in this table.

<sup>c</sup>A 2003 modification to the earlier consent orders removed the requirement to test bathroom faucets.

The cities we contacted differed in the testing protocols they used to test for lead in school drinking water.<sup>61</sup> While three of the cities (Boston, Philadelphia, and Syracuse) followed EPA's guidance, using a 250 milliliter sample and a limit of 20 parts per billion for triggering follow-up action, Seattle took a more conservative approach. Using the same sample volume, the school board established 10 parts per billion as its standard for follow-up action. Detroit, on the other hand, used the same protocol that is required for public water systems—a 1 liter sample and 15 parts per billion as the limit.

Some of the remediation measures adopted by the cities we contacted were effective, including installing in-line filters, replacing pipes, and removing fixtures at outlets with test results indicating high lead levels. Other measures required more attention and others inadvertently created new issues for officials to deal with. For example, a Seattle school official noted

<sup>61</sup>In EPA's guidance for schools and child care facilities, the agency recommends using a sample volume of 250 milliliters and establishes lead concentrations greater than 20 parts per billion as the trigger for follow-up action. In contrast, the testing protocol for public water supplies requires a sample volume of 1 liter and follow-up action if lead levels at the 90<sup>th</sup> percentile exceed 15 parts per billion. According to EPA, the testing protocol for water systems is designed to assess lead levels for the system as a whole, using a representative number of households; if applicable, the testing also serves as a means of determining the effectiveness of corrosion control treatment. The protocol for schools and child care facilities is slightly more stringent than that used in water systems, and is designed to determine lead levels at specific outlets.

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that the district decided against instituting a flushing program in its schools because it was too difficult to ensure that staff in individual schools would follow through with the flushing every day. In Boston, a school official told us that using bottled water posed a problem because staff had to make sure that replacement bottles were always available and because it created other issues with pests, vandalism, and spillage.

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**The Extent to Which Drinking Water at Schools and Child Care Facilities Is Contaminated by Lead Is Uncertain, in Part, Because No Clear Focal Point Exists to Collect Available Data**

While a number of cities have detected elevated lead levels in school drinking water, and a few states are beginning to collect information on the status of local testing efforts, little information exists on the extent to which drinking water at schools and child care facilities nationwide may contain unacceptable levels of lead. No focal point exists at the federal or state level to collect and analyze test results or information on cost-effective remediation strategies. As a result, it is difficult to get a sense of the pervasiveness of lead contamination in the drinking water at schools and child care facilities, and to know whether a more concerted effort to address the issue—such as mandatory testing—is warranted. In addition, remediation measures such as providing bottled water, regularly flushing water lines, installing filters, and replacing fixtures and internal piping vary widely in cost and complexity, among other factors. State and local officials have expressed concern about not having sufficient information on the measures, their pros and cons, and circumstances in which particular measures might be more appropriate than others.

At the federal level, EPA's Office of Ground Water and Drinking Water sets drinking water standards and other requirements for public drinking water systems, but generally does not have any direct oversight responsibility for the quality of drinking water in schools or child care facilities.<sup>62</sup> The U.S. Department of Education (Education) is responsible for, among other things, providing guidance and financial assistance to state and local education agencies for elementary and secondary schools. Education's Office of Safe and Drug Free Schools recently signed a memorandum of understanding with EPA, the Centers for Disease Control and Prevention, and various water industry associations with the goal of reducing children's

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<sup>62</sup>Some schools and child care facilities have their own water sources and are subject to Safe Drinking Water Act requirements, such as the lead rule. Such systems are defined as non-transient, noncommunity water systems, which serve at least 25 people for more than 6 months in a year. According to EPA estimates, about 10,000 schools and child care facilities are regulated as non-transient, noncommunity systems but, according to one official, these data are incomplete.



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exposure to lead in drinking water at schools and child care facilities.<sup>63</sup> However, according to an Education official, the department does not have legal authority to compel schools to test for lead in the drinking water. Officials in Washington state saw a need for closer coordination between EPA and Education. The officials believe that local education officials are more likely to respond to guidance on lead and other environmental health issues if Education were to be involved in developing it.

At the state level, responsibility for the environmental health of schools and child care facilities is usually fragmented among multiple agencies. According to EPA, in most states, the same agency that administers the drinking water program—generally the state’s department of environmental protection or department of health—is also responsible for implementing the LCCA. However, we also learned from EPA that the state agencies responsible for administering education programs and licensing child care facilities are usually the ones with the regulatory or oversight authority over environmental conditions in schools and child care facilities. (As noted earlier, some states also have lead poisoning prevention programs to monitor blood lead levels in children and investigate the source of lead exposure when the levels are elevated.) According to some of the states we contacted, the level of coordination among state agencies needs to be improved and the lack of a centralized authority at the state level has complicated efforts to plan and implement a testing program for lead in water in some school districts. For example, in Pennsylvania, state drinking water officials said that several other agencies, including the Departments of Health, Education, and Public Welfare, have a role in overseeing schools and child care facilities—but it was unclear which agency would be best suited to manage a testing program if one were to be required. In contrast, Connecticut officials said that having both the drinking water program and the child care licensing program housed within the same department has been an advantage because it is easier for the programs to share information and coordinate their activities.

We also contacted several school and child care associations to find out if they were involved in or aware of efforts to promote testing for lead in drinking water, collect and analyze the results of testing, or set standards for the environmental health of the facilities. According to a representative

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<sup>63</sup>Specifically, the parties agreed to encourage schools and child care facilities to test drinking water for lead, disseminate the results to the public, and take appropriate actions to correct problems.

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of the National Child Care Association, until recently the association had not been aware of any issues regarding lead in drinking water at child care facilities or involved in any effort to promote testing.<sup>64</sup> The representative commented that one challenge to distributing information on lead in drinking water to child care facilities is the fragmented nature of the child care industry. While the National Head Start Association has been involved with lead poisoning prevention in general, the organization has not done anything specifically related to lead in drinking water.<sup>65</sup> The Healthy Schools Network, Inc. promotes the development of state and national policies, regulations, and funding for environmentally safe and healthy schools. Although the network has published some fact sheets that address the potential health risks from lead exposure, lead in drinking water has not been a priority compared with other environmental issues. While none of these organizations were parties to EPA's recent memorandum of understanding, they have been actively engaged in assisting EPA as the agency revises its guidance for schools and child care facilities, according to EPA officials.

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**State and Local Officials Say Addressing Other Environmental Hazards Takes Priority over Testing for Lead in Drinking Water at Schools and Child Care Facilities**

According to state and local officials, children may be exposed to a variety of environmental hazards at schools and child care facilities, including asbestos, lead in paint or dust, mold, and other substances that affect indoor air quality. The officials told us that dealing with such problems often takes priority over checking for lead in drinking water because, in the case of the other problems, more information is available on the nature and extent of the potential health risks involved. For example, many of the officials we interviewed said that the most significant source of lead exposure—and thus, their primary concern—was lead in paint. Officials from two states also mentioned that lead in jewelry, toys, or pottery is a more significant source of exposure than lead in drinking water. Washington state officials told us that child care facilities also have many competing priorities and cited food handling as one of their major concerns.

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<sup>64</sup>The National Child Care Association is active in 26 states and represents about 8,000 private, licensed child care facilities that are based outside the home. The association does not represent the family home care industry, which consists of an estimated 3,000 individually-owned family homes that offer child care services.

<sup>65</sup>The National Head Start Association represents more than 1 million children, 200,000 staff, including teachers and family service workers, and 2,700 Head Start programs in the U.S.

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At the local level, officials talked about dealing with multiple health and safety issues and the difficulty of prioritizing limited resources. For example, in Detroit, one official told us that dealing with asbestos takes priority over all other environmental concerns, including lead in drinking water. Another Detroit official commented that indoor air quality is another priority because "issues related to breathing are very important to educators." In Philadelphia, a school official noted that a major source of lead in the school district is dust, a problem that requires continuing attention from the maintenance staff, which must set aside time to scrub the areas where dust collects. A Seattle official also mentioned the difficulty posed by competing needs for limited funds. He indicated that the competition is not only among environmental issues, such as mold and asbestos, but, on a broader level, between maintenance and basic classroom expenditures.

Without additional resources—or more compelling evidence that lead in drinking water should be a higher priority—state and local officials, as well as representatives of industry groups, were reluctant to support calls for mandatory testing for lead in drinking water in schools and child care facilities. Many of the officials we interviewed said that more research is needed on several aspects of the lead issue. In addition to wanting more information on the extent to which lead contamination in schools and child care facilities is a problem, some officials also wanted more information on the circumstances in which particular remediation approaches are most effective. Other officials believe that more research is needed on the relationship between children's exposure to lead in drinking water and their blood lead levels.

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## Conclusions

Ensuring that the lead rule adequately protects public health and is fully implemented and enforced should be a high priority for EPA and the states because the potential consequences of lead exposure, particularly for infants and young children, can be significant. However, EPA's hands are tied unless states report complete, accurate, and timely data on the results of required monitoring, the status of corrective actions, and the extent of violations. Without such information, EPA cannot provide effective oversight or target limited resources where they are most needed. Similarly, inconsistencies among the states' policies and practices for implementing the lead rule may lead to uneven levels of public health protection for consumers and thus need to be examined and corrected, as appropriate.

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Given the potential health effects associated with lead contamination, it is important to minimize any unnecessary exposure as a result of leaded materials in the water distribution system or household plumbing. Reevaluating existing standards for the devices used in or near residential plumbing systems would also enhance the effectiveness of the treatment provided by local water systems. In the case of schools and child care facilities, both the vulnerability of the population served by such facilities and the competition for limited resources make it essential to have better information on the nature and extent of lead-contaminated drinking water—and its significance relative to other environmental hazards.

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## Recommendations for Executive Action

We recommend that the Administrator, EPA, take a number of steps to further protect the American public from elevated lead levels in drinking water. Specifically, to improve EPA's ability to oversee implementation of the lead rule and assess compliance and enforcement activities, EPA should

- ensure that data on water systems' test results, corrective action milestones, and violations are current, accurate, and complete and
- analyze data on corrective actions and violations to assess the adequacy of EPA and state enforcement efforts.

To expand ongoing efforts to improve implementation and oversight of the lead rule, EPA should reassess existing regulations and guidance to ensure the following:

- the sites water systems use for tap monitoring reflect areas of highest risk for lead corrosion;
- the circumstances in which states approve water systems for reduced monitoring are appropriate and that systems resume standard monitoring following a major treatment change;
- homeowners who participate in tap monitoring are informed of the test results; and
- states review and approve major treatment changes, as defined by EPA, to assess their impact on corrosion control before the changes are implemented.

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In addition, EPA should:

- collect and analyze data on the impact of lead service line replacement on lead levels and conduct other research, as appropriate, to assess the effectiveness of lead line replacement programs and whether additional regulations or guidance are warranted;
- collect information on (1) the nature and extent of modified sampling arrangements within combined distribution systems and (2) differences in the reporting practices and corrective actions authorized by the states, using this information to reassess applicable regulations and guidance; and
- evaluate existing standards for in-line and endpoint plumbing devices used in or near residential plumbing systems to determine if the standards are sufficiently protective to minimize potential lead contamination.

In order to update its guidance and testing protocols, EPA should collect and analyze the results of any testing that has been done to determine whether more needs to be done to protect users from elevated lead levels in drinking water at schools and child care facilities. In addition, to assist local agencies in making the most efficient use of their resources, EPA should assess the pros and cons of various remediation activities and make the information publicly available.

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## Agency Comments and Our Evaluation

We provided a draft of this report to EPA and the Consumer Product Safety Commission for review and comment. EPA generally agreed with our findings and recommendations. Regarding the completeness of information that EPA has to evaluate implementation of the lead rule, the agency said that it will work with the states to ensure that relevant information is incorporated into the national database and will use the information, in part, to assess the adequacy of enforcement efforts. In addition, EPA agreed that aspects of the regulation need improvement. EPA said that it will address some of these areas as part of its package of revisions to the lead rule that it plans to propose early in 2006, including homeowner notification of test results and criteria for reduced monitoring. EPA also said that it needs additional information before it can address other areas, such as lead service line replacement and plumbing standards, that may warrant regulatory changes. EPA did not comment on our recommendation to reevaluate existing regulations and guidance to ensure that tap

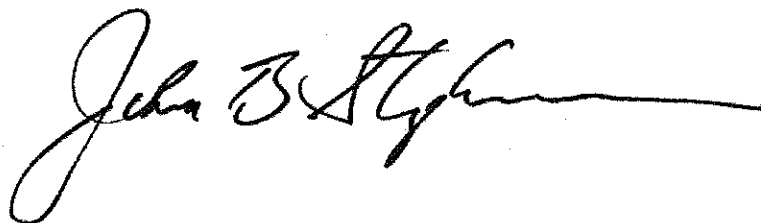
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monitoring sites reflect areas of highest risk for lead corrosion. Finally, EPA did not address our recommendations regarding lead contamination and remedial actions at schools and child care facilities. We believe that, given the particular vulnerability of children to the effects of lead, it is important for EPA to take full advantage of the results of any tests that have been done, as well as to identify those remedial activities that have proven to be most effective. EPA's comments appear in appendix V. The Consumer Product Safety Commission generally agreed with our findings as they pertain to the Commission.

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As agreed with your offices, unless you publicly announce the contents of this report earlier, we plan no further distribution until 30 days from the report date. At that time, we will send copies to appropriate congressional committees; the Administrator, EPA; the Chairman, Consumer Product Safety Commission; and the Director of the Office of Management and Budget. We will also make copies available to others upon request. In addition, the report will be available at no charge on the GAO Web site at <http://www.gao.gov>.

If you or your staff have any questions about this report, please contact me at (202) 512-3841 or [stephensonj@gao.gov](mailto:stephensonj@gao.gov). Contact points for our Offices of Congressional Relations and Public Affairs may be found on the last page of this report. GAO staff who made major contributions to this report are listed in appendix VI.



John B. Stephenson  
Director, Natural Resources  
and Environment

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# Scope and Methodology

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For information on how the lead rule is being implemented, we obtained information from the Environmental Protection Agency's (EPA) Office of Ground Water and Drinking Water and Office of Enforcement and Compliance Assurance, eight EPA regional offices, and 10 states. We selected eight of the states—California, Illinois, Iowa, Massachusetts, Michigan, New York, Pennsylvania, and Washington—because they either had a relatively high number of water systems with test results that exceeded or fell just below the lead action level, or they added to the geographical diversity of our selections. We also included Connecticut and Florida in our review because they were identified by EPA as particularly active in addressing potential lead contamination in water supplies serving child care facilities. At the local level, we obtained information from eight water systems: the Chicago Water Department in Illinois, the Boston Water and Sewer Commission and Massachusetts Water Resources Authority in Massachusetts, the Detroit Water and Sewerage Department in Michigan, the Syracuse Water Department in New York, the Portland Bureau of Water Works in Oregon, the Philadelphia Water Department in Pennsylvania, and Seattle Public Utilities in Washington. Our criteria for selecting these systems included test results showing elevated lead levels, lead service line replacement activity, and/or the use of modified sampling arrangements for consecutive systems. We reviewed the Safe Drinking Water Act, the lead rule, EPA's minor revisions to the lead rule, other pertinent regulations, and applicable guidance to states and water systems.

To gain a national perspective on the data EPA uses for oversight of lead rule implementation, including the results of required testing, the status of corrective actions, and the extent of violations, we analyzed data from EPA's Safe Drinking Water Information System through June 2005 for active community water systems. We assessed the reliability of the data by (1) performing electronic testing of required data elements, (2) reviewing existing information about the data and the system that produced them, (3) interviewing agency officials knowledgeable about the data, and (4) reviewing EPA's own data verification audits and summaries of data reliability. We determined that the data on results and frequency of lead testing were sufficiently reliable to show compliance trends. However, we found that other data on corrective actions and violations were not sufficiently reliable to assess the status of efforts to implement and enforce the lead rule.

For information on experiences in implementing the lead rule and the need for changes to the regulatory framework, we interviewed EPA, state, and local officials; analyzed states' responses to an EPA information request

regarding their policies and practices in implementing the rule; and reviewed other relevant studies and documents. We reviewed the results of EPA's expert workshops on monitoring protocols, simultaneous compliance, lead service line replacement, and public education, and obtained information from several researchers and other drinking water experts. Among other things, we identified potential gaps in the regulatory framework, including oversight, regulations, and guidance, and obtained views on the modifications to the lead rule now being considered by EPA. To learn about the development and effectiveness of existing plumbing standards, we obtained and analyzed information from NSF International (NSF), the Copper Development Association, the Plumbing Manufacturers Institute, and relevant articles and studies. To assess the reliability of NSF's data on lead content and lead leaching of plumbing fittings and fixtures, we talked with foundation officials about data quality control procedures. We determined the data were sufficiently reliable for illustrative purposes.

For information on safeguards against lead-contaminated drinking water at schools and child care facilities, we interviewed officials from the Consumer Product Safety Commission, EPA's Office of Ground Water and Drinking Water, the National Head Start Association, the National Child Care Association, and the Healthy Schools Network. We also obtained information from drinking water program offices and public health or education departments in the 10 states we contacted for the first objective as well as school districts in Boston, Chicago, Detroit, Philadelphia, Seattle, and Syracuse. We reviewed the Lead Contamination Control Act (LCCA) of 1988 and obtained information on the recall of lead-lined water coolers. For information on other actions taken in response to the LCCA, we interviewed EPA, state, and local officials; reviewed relevant studies; and analyzed information collected by EPA. We used the same information sources to determine (1) the extent of current testing and remediation activities for lead in school and child care facility drinking water, (2) the extent to which various entities have responsibility for overseeing or collecting data on such activities, and (3) the relative priorities among environmental hazards common to schools and child care facilities. We also analyzed states' responses to an EPA information request on state and local efforts to monitor and protect children from lead exposure and attended an EPA-sponsored expert workshop on lead in drinking water at schools and child care facilities. For more detailed information on experiences at the local level, we collected information from five school districts on the extent of testing for lead in school drinking water, the results, and the approaches used to address contamination.



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**Appendix I**  
**Scope and Methodology**

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We performed our work between June 2004 and November 2005 in accordance with generally accepted government auditing standards.

# Detailed Analysis of Corrective Action Milestone Data Reported to EPA, by State, through June 2005

State	Large					
	Number of systems			Population of large systems		
	Total number of systems	Number of systems with milestones	Percent of systems without milestones	Total population served	Population in systems without milestones	Percent of population in systems without milestones
AK	1	0	100.0	135,000	135,000	100.0
AL	11	0	100.0	1,881,984	1,881,984	100.0
AR	8	8	0.0	781,325	0	0.0
AZ	13	0	100.0	3,417,902	3,417,902	100.0
CA	160	0	100.0	25,224,420	25,224,420	100.0
CO	16	0	100.0	2,941,619	2,941,619	100.0
CT	9	9	0.0	1,586,458	0	0.0
DC	1	1	0.0	595,000	0	0.0
DE	3	0	100.0	445,504	445,504	100.0
FL	76	3	96.1	12,098,524	11,805,584	97.6
GA	23	18	21.7	4,544,090	507,529	11.2
HI	4	0	100.0	875,238	875,238	100.0
IA	8	1	87.5	793,026	584,383	73.7
ID	4	1	75.0	353,151	300,800	85.2
IL	30	28	6.7	5,367,282	123,603	2.3
IN	14	14	0.0	2,106,043	0	0.0
KS	6	2	66.7	1,172,516	981,341	83.7
KY	8	0	100.0	1,705,135	1,705,135	100.0
LA	15	0	100.0	2,315,098	2,315,098	100.0
MA	29	14	51.7	4,992,887	3,629,018	72.7
MD	9	7	22.2	4,005,168	106,000	2.6
ME	1	0	100.0	113,560	113,560	100.0
MI	31	28	9.7	3,647,640	318,288	8.7
MN	14	8	42.9	1,610,382	370,533	23.0
MO	11	4	63.6	2,586,464	2,347,737	90.8
MS	2	0	100.0	288,257	288,257	100.0
MT	3	0	100.0	208,335	208,335	100.0
NC	24	0	100.0	3,255,476	3,255,476	100.0
ND	2	2	0.0	146,131	0	0.0
NE	2	0	100.0	709,420	709,420	100.0
NH	2	0	100.0	213,000	213,000	100.0

Appendix II  
Detailed Analysis of Corrective Action  
Milestone Data Reported to EPA, by State,  
through June 2005

(Continued From Previous Page)

State	Large					
	Number of systems			Population of large systems		
	Total number of systems	Number of systems with milestones	Percent of systems without milestones	Total population served	Population in systems without milestones	Percent of population in systems without milestones
NJ	21	0	100.0	4,205,795	4,205,795	100.0
NM	4	0	100.0	660,026	660,026	100.0
NV	5	0	100.0	1,876,500	1,876,500	100.0
NY	32	0	100.0	13,079,586	13,079,586	100.0
OH	27	0	100.0	5,720,471	5,720,471	100.0
OK	9	7	22.2	1,538,179	679,000	44.1
OR	11	8	27.3	1,424,645	278,000	19.5
PA	31	31	0.0	5,823,088	0	0.0
RI	4	4	0.0	528,853	0	0.0
SC	12	12	0.0	1,549,312	0	0.0
SD	2	2	0.0	185,983	0	0.0
TN	15	0	100.0	2,221,020	2,221,020	100.0
TX	56	5	91.1	12,580,122	12,268,259	97.5
UT	10	0	100.0	1,197,900	1,197,900	100.0
VA	22	22	0.0	3,979,119	0	0.0
VT	0	N/A	N/A	0	N/A	N/A
WA	23	0	100.0	2,697,616	2,697,616	100.0
WI	13	0	100.0	1,666,474	1,666,474	100.0
WV	2	2	0.0	246,203	0	0.0
WY	2	0	100.0	110,108	110,108	100.0
<b>Total/AVG</b>	<b>841</b>	<b>241</b>	<b>71.3</b>	<b>151,407,035</b>	<b>111,465,519</b>	<b>73.6</b>

Source: GAO analysis of EPA data.

Appendix II  
Detailed Analysis of Corrective Action  
Milestone Data Reported to EPA, by State,  
through June 2005

State	Medium					
	Number of systems			Population of medium systems		
	Total number of systems	Number of systems with milestones	Percent of systems without milestones	Total population served	Population in systems without milestones	Percent of population in systems without milestones
AK	23	0	100.0	200,798	200,798	100.0
AL	266	0	100.0	2,944,220	2,944,220	100.0
AR	139	133	4.3	1,190,159	31,091	2.6
AZ	105	0	100.0	1,227,834	1,227,834	100.0
CA	478	0	100.0	7,476,807	7,476,807	100.0
CO	131	0	100.0	1,726,744	1,726,744	100.0
CT	48	48	0.0	926,493	0	0.0
DC	1	0	100.0	11,000	11,000	100.0
DE	24	0	100.0	298,763	298,763	100.0
FL	310	2	99.4	4,684,659	4,655,307	99.4
GA	184	94	48.9	2,254,876	1,068,475	47.4
HI	33	0	100.0	378,964	378,964	100.0
IA	116	12	89.7	1,173,595	1,099,226	93.7
ID	41	3	92.7	401,222	355,215	88.5
IL	396	378	4.5	5,176,451	192,293	3.7
IN	188	187	0.5	2,025,670	3,661	0.2
KS	81	75	7.4	836,216	24,796	3.0
KY	231	0	100.0	2,657,189	2,657,189	100.0
LA	203	0	100.0	1,827,405	1,827,405	100.0
MA	217	81	62.7	3,788,166	2,339,423	61.8
MD	53	1	98.1	623,854	620,429	99.5
ME	32	0	100.0	339,255	339,255	100.0
MI	249	204	18.1	3,078,142	477,742	15.5
MN	140	44	68.6	1,821,460	1,359,303	74.6
MO	173	166	4.0	1,596,299	39,249	2.5
MS	189	0	100.0	1,758,806	1,758,806	100.0
MT	28	0	100.0	258,541	258,541	100.0
NC	226	0	100.0	2,496,100	2,496,100	100.0
ND	19	19	0.0	229,025	0	0.0
NE	38	0	100.0	403,073	403,073	100.0
NH	34	0	100.0	404,279	404,279	100.0

Appendix II  
Detailed Analysis of Corrective Action  
Milestone Data Reported to EPA, by State,  
through June 2005

(Continued From Previous Page)

State	Medium					
	Number of systems			Population of medium systems		
	Total number of systems	Number of systems with milestones	Percent of systems without milestones	Total population served	Population in systems without milestones	Percent of population in systems without milestones
NJ	207	0	100.0	3,419,920	3,419,920	100.0
NM	55	0	100.0	701,119	701,119	100.0
NV	28	0	100.0	229,455	229,455	100.0
NY	294	0	100.0	3,698,727	3,698,727	100.0
OH	280	0	100.0	3,593,577	3,593,577	100.0
OK	122	105	13.9	1,225,346	130,815	10.7
OR	94	28	70.2	1,222,949	862,909	70.6
PA	292	281	3.8	3,685,523	139,384	3.8
RI	22	18	18.2	420,039	43,700	10.4
SC	141	141	0.0	1,666,077	0	0.0
SD	30	30	0.0	258,637	0	0.0
TN	236	0	100.0	2,745,416	2,745,416	100.0
TX	750	46	93.9	7,370,002	6,950,037	94.3
UT	85	0	100.0	1,088,639	1,088,639	100.0
VA	126	104	17.5	1,783,530	346,752	19.4
VT	30	8	73.3	266,690	151,730	56.9
WA	170	0	100.0	2,217,060	2,217,060	100.0
WI	160	0	100.0	1,696,466	1,696,466	100.0
WV	80	77	3.8	756,976	28,025	3.7
WY	22	0	100.0	225,116	225,116	100.0
Total/AVG	7,620	2,285	70.0	92,487,329	64,944,835	70.2

Source: GAO analysis of EPA data.

Appendix II  
Detailed Analysis of Corrective Action  
Milestone Data Reported to EPA, by State,  
through June 2005

State	Small					
	Number of systems			Population of small systems		
	Total number of systems	Number of systems with milestones	Percent of systems without milestones	Total population served	Population in systems without milestones	Percent of population in systems without milestones
AK	412	0	100.0	128,713	128,713	100.0
AL	342	0	100.0	437,400	437,400	100.0
AR	582	548	5.8	569,267	23,567	4.1
AZ	675	0	100.0	334,986	334,986	100.0
CA	2,488	0	100.0	995,796	995,796	100.0
CO	684	0	100.0	378,345	378,345	100.0
CT	529	443	16.3	160,534	16,676	10.4
DC	1	0	100.0	0	0	N/A
DE	202	0	100.0	92,110	92,110	100.0
FL	1,503	9	99.4	799,213	793,025	99.2
GA	1,484	660	55.5	601,723	324,449	53.9
HI	78	0	100.0	72,007	72,007	100.0
IA	1,019	64	93.7	614,789	562,918	91.6
ID	707	81	88.5	211,117	182,893	86.6
IL	1,367	1,216	11.0	1,071,477	92,176	8.6
IN	638	628	1.6	503,685	4,818	1.0
KS	824	649	21.2	560,103	115,971	20.7
KY	179	0	100.0	259,090	259,090	100.0
LA	893	0	100.0	743,960	743,960	100.0
MA	278	83	70.1	161,166	110,437	68.5
MD	440	271	38.4	217,804	87,464	40.2
ME	366	0	100.0	165,359	165,359	100.0
MI	1,158	971	16.1	716,406	173,559	24.2
MN	811	143	82.4	531,720	395,653	74.4
MO	1,281	1,168	8.8	739,179	38,519	5.2
MS	980	1	99.9	1,032,244	1,031,729	100.0
MT	647	2	99.7	206,237	203,914	98.9
NC	1,924	0	100.0	726,326	726,326	100.0
ND	299	284	5.0	177,573	8,747	4.9
NE	566	0	100.0	304,924	304,924	100.0
NH	662	0	100.0	200,898	200,898	100.0

Appendix II  
Detailed Analysis of Corrective Action  
Milestone Data Reported to EPA, by State,  
through June 2005

(Continued From Previous Page)

State	Small					
	Number of systems			Population of small systems		
	Total number of systems	Number of systems with milestones	Percent of systems without milestones	Total population served	Population in systems without milestones	Percent of population in systems without milestones
NJ	381	0	100.0	257,045	257,045	100.0
NM	586	0	100.0	251,374	251,374	100.0
NV	220	0	100.0	106,349	106,349	100.0
NY	2,492	1	100.0	1,131,590	1,131,240	100.0
OH	1,014	0	100.0	739,441	739,441	100.0
OK	1,004	378	62.4	679,858	332,062	48.8
OR	769	108	86.0	324,386	251,660	77.6
PA	1,813	1,670	7.9	960,679	50,135	5.2
RI	57	40	29.8	26,914	10,630	39.5
SC	506	483	4.5	270,387	8,152	3.0
SD	435	382	12.2	216,413	12,348	5.7
TN	430	0	100.0	417,026	417,026	100.0
TX	3,683	165	95.5	2,724,725	2,554,606	93.8
UT	356	0	100.0	208,654	208,654	100.0
VA	1,117	874	21.8	482,223	95,023	19.7
VT	405	42	89.6	172,502	138,701	80.4
WA	2,084	0	100.0	693,052	693,052	100.0
WI	913	0	100.0	517,366	517,366	100.0
WV	455	432	5.1	413,870	10,363	2.5
WY	252	0	100.0	103,403	103,403	100.0
<b>Total/AVG</b>	<b>42,991</b>	<b>11,796</b>	<b>72.6</b>	<b>24,411,408</b>	<b>16,895,059</b>	<b>69.2</b>

Source: GAO analysis of EPA data.

# Number of Lead Rule Violations Reported to EPA Between 1995 and June 2005 (by State)

State	Number of systems	Number of violations			Number of systems with violations					
		TT	MR	Total	TT	Percent of total systems with TT violations	MR	Percent of total systems with MR violations	Total	Percent of total systems with violations
AK	436	4	586	590	3	0.7	252	57.8	254	58.3
AL	619	0	91	91	0	0.0	65	10.5	65	10.5
AR	729	28	38	66	23	3.2	32	4.4	50	6.9
AZ	793	0	1,100	1,100	0	0.0	419	52.8	419	52.8
CA	3,126	0	144	144	0	0.0	136	4.4	136	4.4
CO	831	28	262	290	10	1.2	195	23.5	201	24.2
CT	586	29	232	261	25	4.3	168	28.7	176	30.0
DE	229	0	3	3	0	0.0	3	1.3	3	1.3
FL	1,889	10	74	84	10	0.5	68	3.6	76	4.0
GA	1,691	8	1,927	1,935	8	0.5	1,015	60.0	1,016	60.1
HI	115	0	0	0	0	0.0	0	0.0	0	0.0
IA	1,143	1	100	101	1	0.1	85	7.4	86	7.5
ID	752	9	866	875	9	1.2	269	35.8	274	36.4
IL	1,793	292	670	962	170	9.5	330	18.4	423	23.6
IN	840	90	279	369	54	6.4	127	15.1	138	16.4
KS	911	62	105	167	44	4.8	83	9.1	119	13.1
KY	418	0	200	200	0	0.0	147	35.2	147	35.2
LA	1,111	0	132	132	0	0.0	132	11.9	132	11.9
MA	524	81	219	300	60	11.5	137	26.1	189	36.1
MD	502	69	231	300	40	8.0	156	31.1	165	32.9
ME	399	63	188	251	44	11.0	88	22.1	107	26.8
MI	1,438	9	116	125	8	0.6	101	7.0	107	7.4
MN	965	3	104	107	3	0.3	76	7.9	77	8.0
MO	1,465	2	420	422	2	0.1	330	22.5	332	22.7
MS	1,171	0	35	35	0	0.0	32	2.7	32	2.7
MT	678	8	590	598	8	1.2	225	33.2	228	33.6
NC	2,174	233	411	644	143	6.6	269	12.4	356	16.4
ND	320	7	36	43	6	1.9	16	5.0	20	6.3
NE	606	59	4	63	58	9.6	4	0.7	62	10.2
NH	698	18	107	125	14	2.0	91	13.0	100	14.3
NJ	609	3	108	111	3	0.5	79	13.0	81	13.3
NM	645	0	54	54	0	0.0	49	7.6	49	7.6



**Appendix III**  
**Number of Lead Rule Violations Reported to**  
**EPA Between 1995 and June 2005 (by State)**

(Continued From Previous Page)

State	Number of systems	Number of violations			Number of systems with violations					
		TT	MR	Total	TT	Percent of total systems with TT violations	MR	Percent of total systems with MR violations	Total	Percent of total systems with violations
NV	253	1	113	114	1	0.4	84	33.2	84	33.2
NY	2,818	62	451	513	52	1.8	327	11.6	362	12.8
OH	1,321	38	767	805	35	2.6	421	31.9	436	33.0
OK	1,135	2	311	313	1	0.1	120	10.6	120	10.6
OR	874	138	94	232	94	10.8	65	7.4	127	14.5
PA	2,136	75	800	875	72	3.4	528	24.7	572	26.8
RI	83	1	4	5	1	1.2	4	4.8	4	4.8
SC	659	92	365	457	60	9.1	218	33.1	238	36.1
SD	467	4	431	435	4	0.9	211	45.2	213	45.6
TN	681	0	36	36	0	0.0	19	2.8	19	2.8
TX	4,489	46	54	100	29	0.6	54	1.2	81	1.8
UT	451	0	315	315	0	0.0	186	41.2	186	41.2
VA	1,265	52	253	305	47	3.7	185	14.6	221	17.5
VT	435	8	135	143	7	1.6	108	24.8	114	26.2
WA	2,277	4	1,548	1,552	4	0.2	1,272	55.9	1,276	56.0
WI	1,086	10	210	220	8	0.7	129	11.9	134	12.3
WV	537	3	335	338	3	0.6	153	28.5	154	28.7
WY	276	1	98	99	1	0.4	80	29.0	80	29.0
<b>Total</b>	<b>51,449</b>	<b>1,653</b>	<b>15,752</b>	<b>17,405</b>	<b>1,165</b>	<b>2.3</b>	<b>9,343</b>	<b>18.2</b>	<b>10,041</b>	<b>19.5</b>

Legend: TT = treatment technique violations, including failure to install optimal corrosion control treatment, failure to meet water quality control parameters, failure to replace lead service lines, and failure to meet public education requirements, among other things.

MR = monitoring and reporting violations, including the failure to conduct required testing and failure to report the results.

Source: GAO analysis of EPA data.

Note: The total number of systems with violations, and the numbers of systems with TT and MR violations do not add to the total numbers of violations because in some cases, systems have more than one type of violation.

# Information on Selected EPA and State Enforcement Actions, by Type, from 1995 to June 2005<sup>a</sup>

Type of Action	Years											Totals
	1995	1996	1997	1998	1999	2000	2001	2002	2003	2004	2005	
Public notification requested												
State	1,359	1,070	1,190	1,223	1,097	791	988	934	1,136	940	1,174	11,902
Federal	277	28	15	5	6	8	3	9	1	1	3	356
Formal notice of violation												
State	969	700	526	452	499	602	606	581	649	549	647	6,780
Federal	614	273	83	177	73	39	91	4	8	22	6	1,390
Bilateral compliance agreement												
State	52	119	79	87	60	40	69	91	99	89	24	837
Federal	0	5	1	2	0	0	0	0	1	0	0	9
Administrative orders												
State (without penalties)	107	93	89	114	83	45	89	68	71	78	21	837
State (with penalties)	84	67	42	319	97	52	52	56	49	57	5	880
Federal (proposed)	561	153	4	1	0	0	0	3	0	0	0	272
Federal (final)	145	146	197	64	29	13	9	10	24	17	5	659
Administrative penalties assessed												
State	11	28	19	21	26	10	41	31	33	30	3	253
Complaint for penalty issued <sup>b</sup>												
Federal	9	0	10	10	8	3	0	3	0	0	0	43
Civil cases referred												
State (to attorney general)	10	15	21	13	10	3	3	1	9	9	3	97
Federal (to Department of Justice)	0	0	4	1	0	0	0	0	0	54	0	59
Criminal cases filed												
State	1	2	1	0	3	0	0	0	0	0	0	7
Federal	0	0	0	0	0	0	0	0	0	0	0	0

Source: GAO analysis of EPA data.

Notes:

<sup>a</sup>We included the most commonly used enforcement actions in this table and excluded miscellaneous actions and activities unrelated to enforcement or the lead rule.

<sup>b</sup>EPA files a "complaint for penalty" when the terms of an administrative order are violated.

# Comments from the Environmental Protection Agency



UNITED STATES ENVIRONMENTAL PROTECTION AGENCY  
WASHINGTON, D.C. 20460

NOV 18 2006

OFFICE OF  
WATER

John B. Stephenson  
Director, Natural Resources and the Environment  
Government Accountability Office  
Washington, DC 20548

Dear Mr. Stephenson:

Thank you for the opportunity to review the proposed Government Accountability Office (GAO) Report; *Drinking Water: EPA Should Strengthen Ongoing Efforts to Ensure that Consumers are Protected from Lead Contamination*. We appreciate the information in the report and are fully committed to strengthening consumer protections from lead contamination..

As your report acknowledges, the Environmental Protection Agency (EPA) has been working since early 2004 to better understand implementation of the Lead and Copper Rule nationwide. On March 7, 2005, we announced the Drinking Water Lead Reduction Plan, a series of efforts we are undertaking to revise regulations and guidance in order to improve implementation of the rule. We will continue to collect and analyze information to help us target areas where implementation needs to be further improved. We want to ensure this rule, which has been critical in lowering exposure to lead in drinking water, continues to be successful.

Your staff evaluated (1) the completeness of information that EPA has to evaluate implementation, (2) areas of the rule where modifications could strengthen public health protection, and (3) the availability of information to assess the quality of drinking water in schools and child care facilities with respect to lead. I would like to respond to your findings in each of these areas.

#### *Lead Compliance Information*

Your report fairly represents the challenges that we faced in working to understand the effectiveness of the rule in reducing exposure to lead in drinking water. In initiating our review, our focus was on understanding the extent to which utilities were currently exceeding the 15 ppb action level. While states were responsive to our immediate request, your report correctly indicates that many have not continued to focus on adding new data reported by utilities to the database. We will continue to emphasize to states the importance of having this data to understand national implementation and will work with our Office of Enforcement and Compliance Assurance to assess the adequacy of enforcement efforts.

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Your report stresses that information on how utilities have met milestones associated with taking steps to meet the rule is important in determining the effectiveness of implementation. As you noted, our Safe Drinking Water Information System (SDWIS) has incomplete data for milestones that were effective with revisions to the rule in 2000. However, while your report accurately characterizes the incompleteness of new milestones, we believe it is important to note that an absence of new milestone data does not necessarily mean that utilities did not take steps to implement corrosion control. Many states failed to update their data to convert the older milestones that were used with the 1991 rule into the new milestones for individual systems. For example, in Wisconsin, although none of the 13 large systems have the new DEEM or DONE milestones in SDWIS, 9 did have a milestone under the old data structure to indicate that optimal corrosion control treatment had been installed. However, notwithstanding that difference, it is accurate to state that data for milestones - under both the old and new structures - is incomplete. We will work with states over the coming year to ensure that relevant information is loaded into SDWIS.

*Reassessment of the Regulation*

Your report describes several areas where you believe there are opportunities to improve the effectiveness of the rule. We agree with GAO that these areas warrant additional attention and we are addressing some of them (e.g., criteria for reducing monitoring, customer notification, management of treatment changes) as part of our package of revisions to the Lead and Copper Rule that we will be proposing early in the new year. Our decision to revise several provisions in the rule was based on a review of our information request to states asking how they were implementing provisions of the rule and feedback we heard from stakeholders during the expert workshops we conducted during 2004.

However, we need additional information before we can address several of the other issues discussed in the report, including data on the effectiveness of lead service line replacement programs and analysis to determine appropriate monitoring requirements for combined distribution systems. Ongoing research projects being funded by the American Water Works Association Research Foundation should help inform efforts on lead service line replacement and the sufficiency of existing requirements related to lead content and leaching potential of devices used in residential plumbing.

*Programs to Control Lead in Drinking Water at School and Child Care Facilities*

We take seriously the issue of lead in schools and child care facilities, as children are more vulnerable to the negative effects of lead. We agree with you that there is insufficient information to determine whether there are widespread problems with lead in school drinking water. However, we understand the concerns that water utilities have about being considered the

Appendix V  
Comments from the Environmental  
Protection Agency

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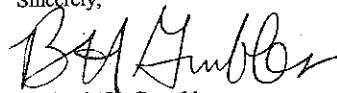
responsible party for drinking water quality within specific facilities. Although some water utilities are working with local communities to facilitate testing, ultimately they have no authority over conditions within a specific facility. We believe that approaches such as that in Connecticut, which requires testing of drinking water to be conducted as part of the licensing process for child care facilities, represent a more commonsense approach to ensuring that children are protected. We also acknowledge the concerns of state administrators about balancing risks of exposure to lead in drinking water with other environmental exposures within school environments.

Because there are no federal requirements for testing drinking water in schools that are not already a public water system, we are strongly advocating a voluntary program to encourage school districts to test drinking water. As your report notes, we have entered into a memorandum of understanding with the Department of Education, Centers for Disease Control and Prevention, Association of State Drinking Water Administrators and associations representing drinking water utilities. We are committed to work with these organizations and other organizations representing schools and child care facilities to encourage greater consideration of drinking water quality. We are working to release a revised guidance document for testing drinking water in schools and additional products over the next several months.

Our experience with the lead rule reminds us that a regulation is only effective if it is effectively implemented. We understand that EPA regional staff, state staff, and utility managers face challenges in carrying out federal requirements in addition to their other duties. But the experience of Washington, DC reminds us of the importance of maintaining public confidence in the safety of drinking water. We believe that improvements are already happening due to the renewed emphasis on rule. Many states have begun efforts to review their programs and have already made changes to improve oversight and reporting. However, staff at local, state and federal levels must continue to carry out implementation and oversight activities to ensure that public confidence is maintained.

I appreciated the opportunity to coordinate with your staff on this project. Should you need additional information or have further questions, please contact me or Cynthia C. Dougherty, Director of the Office of Ground Water and Drinking Water at (202) 564-3750.

Sincerely,



Benjamin H. Grumbles  
Assistant Administrator

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# GAO Contact and Staff Acknowledgments

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## GAO Contact

John B. Stephenson (202) 512-3841

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## Staff Acknowledgments

In addition to the individual named above, Ellen Crocker, Nancy Crothers, Sandra Edwards, Maureen Driscoll, Benjamin Howe, Julian Klazkin, Jean McSween, Chris Murray, and George Quinn, Jr. made key contributions to this report.

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UNITED STATES ENVIRONMENTAL PROTECTION AGENCY  
WASHINGTON, D.C. 20460

FEB 29 2016

OFFICE OF CONGRESSIONAL AND  
INTERGOVERNMENTAL RELATIONS

State and Local Partners at NGA, ECOS, ASTHO, ASDWA, AMWA, AWWA, NRWA, ACWA, NCSL, USCM, NLC, NACO, NACCHO and Members of EPA's LGAC:

There is no higher priority for the U.S. Environmental Protection Agency (EPA) than protecting public health. To that end, we are appreciative of the ongoing partnership we have with you and with your members across the United States.

Recent events in several U.S. cities have led to important discussions about the safety of our nation's drinking water supplies, particularly around lead. In an effort to further a national conversation on drinking water, as well as bring greater transparency to efforts to identify and address lead action level exceedances, today Administrator McCarthy and Joel Beauvais, Deputy Assistant Administrator, EPA Office of Water, have sent letters to governors and to state primacy agencies, respectively. The letters, the text of which I am enclosing, ask for continued partnership in the state implementation of the Lead and Copper Rule.

Ensuring the safety of our drinking water supplies is a shared responsibility involving state, tribal, local and federal governments, together with system owners and operators, consumers and others. Thank you for your work, and do not hesitate reaching out to me at [rupp.mark@epa.gov](mailto:rupp.mark@epa.gov) or (202) 564-7178.

Sincerely,

A handwritten signature in black ink, reading "Mark W. Rupp", is written over a horizontal line.

Mark W. Rupp  
Deputy Associate Administrator, Office of  
Intergovernmental Relations

Enclosures

[Governors]

Dear xxx:

There is no higher priority for the U.S. Environmental Protection Agency (EPA) than protecting public health and ensuring the safety of our nation's drinking water. Under the Safe Drinking Water Act (SDWA), [INSERT STATE NAME] and most other states have the primary responsibility for the implementation and enforcement of drinking water regulations, while EPA is tasked with oversight of state efforts. Recent events in Flint, Michigan and other U.S. cities, have led to important discussions about the safety of our nation's drinking water supplies, which is why I am writing to you today.

I am asking you to join me in taking action to strengthen protection of our nation's drinking water, which is a shared responsibility involving state, tribal, local and federal governments, system owners and operators, consumers and other stakeholders. We must work together to address the broad set of challenges and opportunities we face – including in the areas of infrastructure finance and investment, science, technology, legacy and emerging contaminants, regulatory oversight, risk assessment and public engagement and education.

As part of the EPA's immediate effort to properly oversee state implementation of the Lead and Copper Rule, my staff will be meeting with every state drinking water program across the country to ensure that states are taking appropriate actions to identify and address lead action level exceedances and fully implementing and enforcing this important rule. I ask that you encourage your state agency to give this effort the highest priority, consistent with our shared commitment and partnership to address lead risks.

In the near-term, I also ask for your leadership in taking action to enhance public transparency and accountability in the implementation of the Lead and Copper Rule to assure the public that all levels of government are working together to address lead risks. By separate letter, the EPA's Office of Water has written to the head of your state primacy agency detailing our requests and recommendations. In that letter we urge enhanced efforts to provide the public with better and quicker information on risks associated with lead in drinking water and how to abate them. We also ask states to promptly inform residents of lead sample results from their homes, as well as the general public where systems are experiencing high lead levels. And we point out the tremendous value of using public websites to disclose state lead sampling protocols and guidance, lead sampling results, and water system inventories of lead service lines. This is the most effective approach to assure the public that we are doing everything we can to work together to address lead risk, and I would ask your support to take these steps quickly.

In the coming weeks and months, we will be working with states and other stakeholders to identify strategies and actions to improve the safety and sustainability of our drinking water systems, including:

- ensuring adequate and sustained investment in, and attention to, regulatory oversight at all levels of government;

- using information technology to enhance transparency and accountability with regard to reporting and public availability of drinking water compliance data;
- leveraging additional funding sources to finance maintenance, upgrading and replacement of aging infrastructure, especially for poor and overburdened communities; and
- identifying technology and infrastructure to address both existing and emerging contaminants.

Thank you in advance for your support to ensure that we are fulfilling our joint responsibility for the protection of public health and to restore public confidence in our shared work to ensure safe drinking water for the American people. Please do not hesitate to contact me, and your staff can always contact Mark Rupp, Deputy Associate Administrator for Intergovernmental Relations, at [rupp.mark@epa.gov](mailto:rupp.mark@epa.gov) or (202) 564-7178.

As always, the EPA appreciates your leadership and engagement as a partner in our efforts to protect public health and the environment.

Sincerely,

Gina McCarthy

[Commissioners]

Dear xxx:

There is no higher priority for the U.S. Environmental Protection Agency (EPA) than protecting public health and ensuring the safety of our nation's drinking water. Under the Safe Drinking Water Act (SDWA), [INSERT STATE NAME] and other states have the primary responsibility for the implementation and enforcement of drinking water regulations, while EPA is tasked with oversight of state efforts. Recent events in Flint, Michigan and other U.S. cities, have led to important discussions about the safety of our nation's drinking water supplies. I am writing today to ask you to join in taking action to strengthen our safe drinking water programs, consistent with our shared recognition of the critical importance of safe drinking water for the health of all Americans.

First, with most states having primacy under SDWA, we need to work together to ensure that states are taking action to demonstrate that the Lead and Copper Rule is being properly implemented. To this end, the EPA Office of Water is increasing oversight of state programs to identify and address any deficiencies in current implementation of the Lead and Copper Rule. EPA staff are meeting with every state drinking water program across the country to ensure that states are taking appropriate actions to address lead action level exceedances, including optimizing corrosion control, providing effective public health communication and outreach to residents on steps to reduce exposures to lead, and removing lead service lines where required by the LCR. I ask you to join us in giving these efforts the highest priority.

Second, to assure the public of our shared commitment to addressing lead risks, I ask for your leadership in taking near-term actions to assure the public that we are doing everything we can to work together to address risks from lead in drinking water. Specifically, I urge you to take near-term action in the following areas:

- (1) Confirm that the state's protocols and procedures for implementing the LCR are fully consistent with the LCR and applicable EPA guidance;
- (2) Use relevant EPA guidance on LCR sampling protocols and procedures for optimizing corrosion control;
- (3) Post on your agency's public website all state LCR sampling protocols and guidance for identification of Tier 1 sites (at which LCR sampling is required to be conducted);
- (4) Work with public water systems – with a priority emphasis on large systems – to increase transparency in implementation of the LCR by posting on their public website and/or on your agency's website:

- the materials inventory that systems were required to complete under the LCR, including the locations of lead service lines, together with any more updated inventory or map of lead service lines and lead plumbing in the system; and
  - LCR compliance sampling results collected by the system, as well as justifications for invalidation of LCR samples; and
- (5) Enhance efforts to ensure that residents promptly receive lead sampling results from their homes, together with clear information on lead risks and how to abate them, and that the general public receives prompt information on high lead levels in drinking water systems.

These actions are essential to restoring public confidence in our shared work to ensure safe drinking water for the American people. I ask you for your leadership and partnership in this effort and request that you respond in writing, within the next 30 days, to provide information on your activities in these areas.

To support state efforts to properly implement the LCR, the EPA will be providing information to assist states in understanding steps needed to ensure optimal corrosion control treatment and on appropriate sampling techniques. I am attaching to this letter a memorandum from the EPA's Office of Groundwater and Drinking Water summarizing EPA recommendations on sampling techniques. We will also be conducting training for state and public water systems staff to ensure that all water systems understand how to carry out the requirements of the LCR properly. Finally, we are working to revise and strengthen the LCR, but those revisions will take time to propose and finalize; our current expectation is that proposed revisions will be issued in 2017. The actions outlined above are not a substitute for needed revisions to the rule, but we can and should work together to take immediate steps to strengthen implementation of the existing rule.

While we have an immediate focus on lead in drinking water, we recognize that protection of the nation's drinking water involves both legacy and emerging contaminants, and a much broader set of scientific, technical and resource challenges as well as opportunities. This is a shared responsibility involving state, tribal, local and federal governments, system owners and operators, consumers and other stakeholders. Accordingly, in the coming weeks and months, we will be working with states and other stakeholders to identify strategies and actions to improve the safety and sustainability of our drinking water systems, including:

- ensuring adequate and sustained investment in, and attention to, regulatory oversight at all levels of government;
- using information technology to enhance transparency and accountability with regard to reporting and public availability of drinking water compliance data;
- leveraging funding sources to finance maintenance, upgrading and replacement of aging infrastructure, especially for poor and overburdened communities; and
- identifying technology and infrastructure to address both existing and emerging contaminants.

As always, the EPA appreciates your leadership and engagement as a partner in our efforts to protect public health and the environment. Please do not hesitate to contact me, and your staff

can always contact Peter Grevatt, Director of the Office of Ground Water and Drinking Water and 202-564-8954, or [grevatt.peter@epa.gov](mailto:grevatt.peter@epa.gov).

Thank you in advance for your support to ensure that we are fulfilling our joint responsibility for the protection of public health and to restore public confidence in our shared work to ensure safe drinking water for the American people.

Sincerely,

Joel Beauvais

Deputy Assistant Administrator

Date Signed: February 29, 2016




UNITED STATES ENVIRONMENTAL PROTECTION AGENCY  
WASHINGTON, D.C. 20460

FEB 29 2016

OFFICE OF  
WATER**MEMORANDUM**

SUBJECT: Clarification of Recommended Tap Sampling Procedures for Purposes of the Lead and Copper Rule

FROM: Peter C. Grevatt, Director  
Office of Ground Water & Drinking Water 

TO: Water Division Directors  
Regions I - X

The Lead and Copper Rule, 40 C.F.R. Sections 141.80 to 141.91, requires monitoring at consumer taps to identify levels of lead in drinking water that may result from corrosion of lead-bearing components in a public water system's distribution system or in household plumbing. These samples help assess the need for, or the effectiveness of, corrosion control treatment. The purpose of this memorandum is to provide recommendations on how public water systems should address the removal and cleaning of aerators, pre-stagnation flushing, and bottle configuration for the purpose of Lead and Copper Rule sampling.

**Removal and Cleaning of Aerators**

EPA issued a memorandum on *Management of Aerators during Collection of Tap Samples to Comply with the Lead and Copper Rule* on October 20, 2006. This memorandum stated that EPA recommends that homeowners regularly clean their aerators to remove particulate matter as a general practice, but states that public water systems should not recommend the removal or cleaning of aerators prior to or during the collection of tap samples gathered for purposes of the Lead and Copper Rule. EPA continues to recommend this approach. The removal or cleaning of aerators during collection of tap samples could mask the added contribution of lead at the tap, which may potentially lead to the public water system not taking additional actions needed to reduce exposure to lead in drinking water. EPA's recommendation about the removal and cleaning of aerators during sample collection applies only to monitoring for lead and copper conducted pursuant to 40 C.F.R. 141.86.

**Pre-Stagnation Flushing**

EPA is aware that some sampling instructions provided to residents include recommendations to flush the tap for a specified period of time prior to starting the minimum 6-hour stagnation time required for samples collected under the Lead and Copper Rule. This practice is called pre-stagnation flushing. Pre-stagnation flushing may potentially lower the lead levels as compared to when it is not practiced.

Flushing removes water that may have been in contact with the lead service line for extended periods, which is when lead typically leaches into drinking water. Therefore, EPA recommends that sampling instructions not contain a pre-stagnation flushing step.

### Bottle Configuration

EPA recommends that wide-mouth bottles be used to collect Lead and Copper compliance samples. It has become apparent that wide-mouth bottles offer advantages over narrow-necked bottles because wide-mouth bottles allow for a higher flow rate during sample collection which is more representative of the flow that a consumer may use to fill up a glass of water. In addition, a higher flow rate can result in greater release of particulate and colloidal lead and therefore is more conservative in terms of identifying lead concentrations.

### Conclusion

EPA is providing these recommendations for collection of Lead and Copper Rule tap samples to better reflect the state of knowledge about the fate and transport of lead in distribution systems. The three areas discussed above may potentially lead to samples that erroneously reflect lower levels of lead concentrations. The recommendations in this memorandum are also consistent with the recommendations provided by the EPA's Flint Task Force. For more information about the Task Force please view EPA's website at: <http://www.epa.gov/flint>.

To provide further information on this topic, EPA included an amended "Suggested Directions for Homeowner Tap Sample Collection Procedures" in Appendix D of the 2010 revision of *Lead and Copper Rule Monitoring and Reporting Guidance for Public Water Systems* (EPA 816-R-10-004). This document can be found at:

<http://nepis.epa.gov/Exe/ZyPDF.cgi?Dockey=P100DP2P.txt>

Please share these recommendations with your state drinking water program directors. If you have any questions, please contact Anita Thompkins at [thompkins.anita@epa.gov](mailto:thompkins.anita@epa.gov).

### Attachment

cc: James Taft, Association of State Drinking Water Administrators



## Suggested Directions for Homeowner Tap Sample Collection Procedures

### *Revised Version: February 2016*

These samples are being collected to determine the lead and copper levels in your tap water. This sampling effort is required by the U.S. Environmental Protection Agency and your State under the Lead and Copper Rule, and is being accomplished through a collaboration between the public water system and their consumers (e.g. residents).

Collect samples from a tap that has not been used for at least 6 hours. To ensure the water has not been used for at least 6 hours, the best time to collect samples is either early in the morning or in the evening upon returning from work. Be sure to use a kitchen or bathroom cold water tap that has been used for drinking water consumption in the past few weeks. The collection procedure is described below.

1. Prior arrangements will be made with you, the customer, to coordinate the sample collection. Dates will be set for sample kit delivery and pick-up by water system staff.
2. There must be a minimum of 6 hours during which there is no water used from the tap where the sample will be collected and any taps adjacent or close to that tap. Either early mornings or evenings upon returning home are the best sampling times to ensure that the necessary stagnant water conditions exist. Do not intentionally flush the water line before the start of the 6 hour period.
3. Use a kitchen or bathroom cold-water faucet for sampling. If you have water softeners on your kitchen taps, collect your sample from the bathroom tap that is not attached to a water softener, or a point of use filter, if possible. Do not remove the aerator prior to sampling. Place the opened sample bottle below the faucet and open the cold water tap as you would do to fill a glass of water. Fill the sample bottle to the line marked "1000-mL" and turn off the water.
4. Tightly cap the sample bottle and place in the sample kit provided. Please review the sample kit label at this time to ensure that all information contained on the label is correct.
5. If any plumbing repairs or replacement has been done in the home since the previous sampling event, note this information on the label as provided. Also if your sample was collected from a tap with a water softener, note this as well.
6. Place the sample kit in the same location the kit was delivered to so that water system staff may pick up the sample kit.
7. Results from this monitoring effort and information about lead will be provided to you as soon as practical but no later than 30 days after the system learns of the tap monitoring results. However, if excessive lead and/or copper levels are found, immediate notification will be provided (usually 1-2 working days after the system learns of the tap monitoring results).

Call \_\_\_\_\_ at \_\_\_\_\_ if you have any questions regarding these instructions.

#### TO BE COMPLETED BY RESIDENT

Water was last used: Time \_\_\_\_\_ Date \_\_\_\_\_

Sample was collected: Time \_\_\_\_\_ Date \_\_\_\_\_

Sample Location & faucet (e.g. Bathroom sink): \_\_\_\_\_

I have read the above directions and have taken a tap sample in accordance with these directions.

Signature \_\_\_\_\_

Date \_\_\_\_\_

